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YOUNG LOUISIANA WATERTHRUSH
*(Seiurus motacilla)*

An individual in full juvenal plumage, painted from life by William C. Dilger.

# A LIFE HISTORY STUDY OF THE LOUISIANA WATERTHRUSH

BY STEPHEN W. EATON

THE Louisiana Waterthrush (*Seiurus motacilla*) has been a favorite with naturalists in eastern North America for many years, yet little has been published on its life history except by Chapman (1907) and Bent (1953).

Ithaca, New York, is an ideal place to study the Louisiana Waterthrush. Along almost every stream which cuts steep banks in the hills sloping toward Cayuga Lake, the Louisiana Waterthrush finds a favorite place to rear its young. Steep slopes leading to the floors of the glens facilitate observation of the streams where the birds spend most of their time. Birds building nests or feeding in the glens can be watched from the slopes with the aid of binoculars.

About 345 hours were spent in the study area from April through August during 1947, 1948 and 1949.

In 1947 one nest was watched until the young left the nest, and in 1948 and 1949 my study area was expanded to include 10 small glens in which eight pairs were nesting. These glens were numbered from 1 to 10 for the purposes of the study. Glen No. 1 is the ravine by which Dr. Arthur A. Allen's house is located, No. 2 is the next one north and so on to No. 10, which is approximately 2.4 kilometers north of No. 1 (Fig. 1). In width the study area was approximately 0.8 kilometers from east to west.

Streams in the headwaters of the Susquehanna River system were visited on three occasions. In one of these streams, 24 kilometers south of Ithaca (Prospect Valley), I saw my first Louisiana Waterthrushes of the 1949 season on April 12. On April 26, 1948, I had found a pair building a nest in the same valley, two days before any nests were found started in the Ithaca area. A glen 4.8 kilometers north of Glen No. 1, nicknamed "Chironomus Glen," was often visited to collect birds for the purpose of checking on food habits, habits of the sexes, and molt. Coy Glen, a deeper, longer ravine just southwest of Ithaca, was visited twice to see how many pairs occupied 1.6 kilometers (1 mile) of suitable habitat.

Near Cienfuegos, Cuba, between December 24, 1948, and January 2, 1949, I spent approximately 15 hours along a 1.6-kilometer stretch of fresh-water stream observing the birds' behavior in winter (Eaton, 1953).

Sixteen nests were located during the three-year period; four of these were under observation from nest-building until the young left the nest. The most satisfactory way to find nests was to locate birds building early in the morning. If not found at this time, the nests were difficult to locate until adults were feeding young. When the young were about four days old the nests

were located easily if water in the streams was low. The parents left fecal sacs in the stream within a few feet of the nest. These caught in a backwater not far downstream and were easily seen.

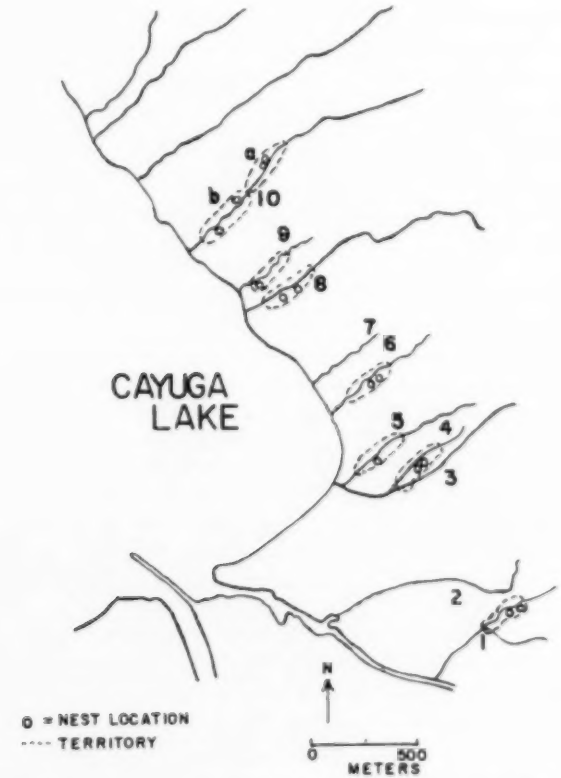


FIG. 1. Map of southeastern corner of Cayuga Lake, near Ithaca, New York. Eight pairs of Louisiana Waterthrushes nested in the ten numbered glens. One nest was located in this area in 1947, nine in 1948, four in 1949. Additional information on these nests is presented in Table 3.

## ACKNOWLEDGMENTS

For guidance during the course of this study I am indebted to Drs. Arthur A. Allen, William J. Hamilton, Jr., and Robert T. Clausen. Dr. John W. Aldrich made available the bird distribution files of the U. S. Fish and Wildlife Service. Dr. William C. Dilger and Mr. Robert Ficken made many valuable suggestions on the manuscript. Mrs. Vireo

Whittaker kindly allowed me to quote from C. F. Stone's field notes. A Louis Agassiz Fuertes Research Grant, awarded by the Wilson Ornithological Club in 1949, aided greatly in financing the field work. William A. Lunk and Keith L. Dixon were of great help in guiding the manuscript through final revision.

## Variation

Ridgway (1902) considered the species as monotypic. He compared samples from the Mississippi Valley and from the Atlantic side of the Appalachians and found no reason to name these populations. I used slightly larger samples and came to the same conclusion.

*Individual Variation.*—This species has much less variation in color than has the Northern Waterthrush (*Seiurus noveboracensis*). The breast and superciliary feathers are white to buffy cream according to the season. Some variation in streaking is evident. A few individuals show light streaking on the throat, a character that is regular in *S. noveboracensis*. Other variable parts of the color pattern are the amount of white striping from the bill over the forehead and crown, and the amount of buffy wash on the flanks and undertail coverts.

*Seasonal Variation.*—In fresh fall plumage this bird is beautiful with its olive upperparts and buffy cream underparts. Birds I collected in Cuba during December and January had lost little of this fall coloration, and Ridgway (*op. cit.*: 639) wrote ". . . I could not find that there is any difference in plumage according to season, some birds taken in April and May being quite as strongly colored as any autumnal or winter specimen." In late May and June, however, the plumage becomes very worn. The upperparts become browner and the underparts lose the buffy-cream "wash" of the fall. Some birds show a buffy collar about the neck, and sometimes individuals become almost bald on the back of the head.

*Age Variation.*—Birds in first fall plumage have rufous edgings on the tertials, and lack white tips on the inner vanes of the outer one to three pairs of rectrices. Nine juveniles from the Ithaca region, collected shortly after assuming most of the first fall plumage, show no trace of white in the tail. A bird raised in captivity until it had assumed the first fall plumage showed no white tipping. Twenty-eight of 51 birds (55 per cent) collected in April, May and June showed the white tipping; 23 (45 per cent) lacked even a trace. A bird banded as a six-day-old nestling in 1947 was collected on April 28, 1949, and he showed distinct white tipping. This white tipping of the rectrices, then, serves to separate first-year birds from those which have completed the first post-nuptial molt. This is a generic character occurring in *Seiurus noveboracensis* (Eaton, 1957*a*) and *S. aurocapillus* (Eaton, 1957*b*).

### Arrival of Males

The first males arrive in the Ithaca area about April 11 (15-year average from Cayuga Bird Club records), but do not become common until about April 25. They usually appear the morning after a warm night with strong south winds. Below is a summary showing dates of first arrival for individuals in the study area. Numbers represent dates in late April except where marked M, which indicates a date in May.

| Glen No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1948 | 29 | | | 18 | 30 | 3 (M) | 28 | 25 | 28 | 28 |
| 1949 | 13 (M) | | | 24 | 22 | 22 | | 15 | 18 | 22 |

After the males arrive, temperatures may drop well below freezing, and snowstorms often occur at this time of year. If the weather is cold the birds do not often sing, and when they do the volume of their songs is much reduced. If the day is warm with a strong south wind, the birds will sing loudly. The cold weather they encounter in April does not seem to be a mortality factor. During snowstorms with the temperature at 27°F., I have watched them feeding along the floor of the glen, flipping leaves on the surface of the water and poking their bills into crannies. The only noticeable effect of the weather was the suppression of song.

The males take possession of territory immediately upon arrival and will sing from trees five to 10 meters above the ground. These advertising songs are given throughout the day with short interruptions for feeding. Frequency of song is about five times per minute, and each song is about three seconds in duration. While singing, the bird sits on a horizontal limb with tail depressed and head thrown back so that the bill is pointing skyward.

### Arrival of Females

In 1949 the first female was seen near Ithaca on April 27, and was already paired to the male in Glen No. 4. It was quite easy to tell when pair formation was accomplished because the male ceased his regular advertising song. Before the females arrive the male in a glen sings consistently throughout the day, stopping for only a few minutes of each hour to feed. At this time males were observed singing even from the ground while feeding, although such observations were unusual. After pair formation is accomplished, males assume an entirely different behavior. They follow the females in the glens, walking a few meters behind and occasionally make a "zizzing" sound. If a male is not following a female he will be perched above her in a tree, and when she has passed beyond him a few meters he will often dive toward her. Near the end of this dive he utters a sputtering noise followed by a "zizzing" sound which seems to come from both male and female. This is perhaps

homologous to the "pounce" of the Song Sparrow, *Melospiza melodia* (Nice, 1943:174). The advertising song is rarely heard again until incubation starts, and even then it is never as loud nor as frequent as it was before the female's arrival. In late June and early July songs were heard occasionally. These songs were found to be from males feeding semi-independent young. A recrudescence of song occurred during the first half of August when the males had completed their post-nuptial molt.

During 1948 the glens were inspected daily for the arrival of the females. Females arrived over a span of 9 days; the males over a span of 15 days. Below is a summary of females' first appearance in the study area in 1948. Sex was determined by behavior.

| Glen No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| April | 29 | | | 27 | | | | 27 | | |
| May | | | | | | 3 | 1 | | 5 | |

## Territory

The territory is long and narrow, following the course of a fast-flowing stream. Along 1.6 kilometers (one mile) of continuously favorable streamside habitat in Coy Glen four pairs were found nesting in 1948. In the study area suitable habitat (exclusive of Glens No. 8 and No. 10) extended approximately 500 meters east from the lake; and one pair was found nesting in all but Glens 2, 3, and 10. In Glen No. 10 two pairs were found nesting in 1948 and 1949, but here favorable habitat extended approximately one kilometer back from the lake. Nests were found only 200 meters apart along this stream; a 30-ft.-high falls marked the boundary of their territories. None was found nesting in Glens 2 and 3.

From these data it appears that one pair of Louisiana Waterthrushes will occupy approximately 400 meters along a stream during the nesting season. Usually nests are located near the center of the territory or 400 meters apart, but in one case (Glen No. 10) they were as close as 200 meters (Fig. 1).

The male of the pair in Glen No. 4 included the lower part of Glen No. 3 in his territory (Fig. 1). Early in the spring of 1948 he also included Glen No. 5 in his territory, but when his female arrived he was not again seen in Glen No. 5. Another male occupied Glen No. 5 after April 30. The male of Glen No. 4 used the unoccupied Glen No. 3 as a feeding area, while his mate used that part of Glen No. 4 upstream from the nest as a feeding area. In Glen No. 10 the female of pair No. 10*a* in 1949 (Fig. 1) collected food for the young downstream from the nest, while the male went approximately 200 meters upstream to get his. This was probably because water in the glen was very low after a prolonged dry spell, and aquatic food was scarce in the vicinity of the nest. In most cases birds were observed feeding in areas along

the stream not so far from the nest. When feeding young they seemed to have distinct foraging areas, one member of the pair usually collecting food upstream, the other downstream.

If another bird of the same species entered the territory a vigorous fight ensued, and the defending male (and perhaps female) always won by driving the other bird out of the ravine and back through the woods in spectacular aerial chases. These fights occurred more often either before the females arrived or during incubation than later, after the young had hatched. On May 4, 1949, in Glen No. 8, I watched a particularly lively scrap which recalled the fights of Snow Buntings (*Plectrophenax nivalis*) as described by Tinbergen (1939:15–16). The male in Glen No. 8 was singing his advertising song when another male (identified by song) came into the glen from the direction of Glen No. 7. The male of Glen No. 8 immediately flew toward the intruder and started to chase him. One bird landed in the center of the highway that crossed the glen at this point and struck a defiant pose—tail up, body crouched and bill horizontal to the ground. The other bird flew down to a point not more than two inches distant and faced the bird on the road. They remained motionless, bill toward bill, for a few seconds and then started to fight. They jumped into the air with a jumble of wings and much "zizzing" and chipping. Then, still locked together in some manner, they drifted over to some nearby hawthorn bushes and fell to the ground. When it was over the Glen No. 8 male resumed his singing and the other bird flew south through the woods toward Glen No. 7.

Pugnacity of the males in the territory was usually less vigorous than that described above. On April 15, 1949, I watched the same male of Glen No. 8 successfully rout an itinerant male. The two birds flew up and down the glen and through the trees on the talus slopes for about three minutes. The distance between the birds in flight was about one to three meters, and the bird behind matched each turn of the bird in front. Sometimes during these chases advertising song was heard. Once, while I was sitting in a blind about 10 meters from a nest, a bird dived toward me from the top of the slope, and, swooping up over me, uttered a beautiful song. It was similar to the perch song but more hurried. Such songs, given on the wing while chasing other birds (or intimidating a blind), I have termed *pursuit* songs because they are somewhat different from the perch or *advertising* song and decidedly different from the *flight* song. The pursuit song is given while the bird is in normal bounding flight; the flight song is given while the bird is flying with rapidly beating wings. All these vocalizations seem to function in maintenance of territory.

### Flight Songs

During the three-year study I failed to see Louisiana Waterthrushes sing

the typical *seiurian* flight song. Ovenbirds and Northern Waterthrushes often sang them at dusk (Table 1). They initiated the flight song by showing increased excitement on or near the ground, their chipping becoming louder and more frequent. Then suddenly they leapt into the air and flew in labored flight over the treetops. This flight was usually parallel to the tops of the trees but sometimes almost straight upwards. Only rarely were the flights under or through the tree canopy. While on this flight Ovenbirds and Northern Waterthrushes uttered a finchlike twittering which ended or was interjected by a recognizable species song. When this was completed they would drop to the ground, or to a low perch about 100 meters from the starting point, but within their territory.

Along a tributary of the Allegheny River near Olean, New York, where I am now living, I have heard the Louisiana Waterthrush give three typical flight songs in the past five years. The whole performance was like its congeners' but louder, longer and more vigorous. Initial chipping started along the stream border, becoming louder and more frequent, followed by the horizontal, labored flight above the trees, twittering song, regular song and the drop to the stream border, approximately 200 meters from the start. The performances were given within the territory. In this area the population of Louisiana Waterthrushes is much lower than in the Ithaca region generally, but this is not stated to imply a solution. Hann (1937) has noted that the Ovenbird gives its flight song more often in some geographic areas than in others.

## Habitat

The 10 glens in the study area are post-glacial gorges. The floors of these glens run in step-like fashion to the lake. A series of two to five falls, formed at more resistant sandstone outcrops along the path of the watercourses, interrupt the smooth flow toward the lake (Fig. 2). Between the falls the water flows along rather flat beds of Devonian shales.

The flora on the acidic slopes between the different glens is mainly a forest of oaks with an understory of ericaceous plants, and *Desmodium* and *Lespedeza*. This contrasts sharply with the flora of the talus slopes leading down to the glen floor. In a strict sense these talus slopes and the stream itself constitute the niche of the Louisiana Waterthrush. On the north-facing slopes the vegetation is usually more dense, and it is here that plants of more northern affinities are found, such as hemlock (*Tsuga canadensis*) and mountain maple (*Acer spicatum*). The south-facing slopes of the glens have fewer trees and are much hotter and drier due to their greater exposure to the sun.

*Use of Habitat.*—When the males arrive they sing in trees up to 12 meters from the ground or talus slopes (usually about nine meters). When flying

TABLE 1

DAILY PATTERN OF FLIGHT SONG ACTIVITY OF *SEIURUS* RECORDED NEAR ITHACA, NEW YORK, DURING THIS STUDY

Each dash represents a flight or pursuit song; below the totals are the numbers of flight songs heard per month. Ovenbird flight songs were recorded while in Northern Waterthrush habitat and would probably have been recorded more frequently had I been concentrating my efforts on the Ovenbird.

| Time | motacilla* | noveboracensis | aurocapillus |
|---|---|---|---|
| 0600 | | | |
| 0630 | | | |
| 0700 | — | | |
| 0730 | | | |
| 0800 | | | |
| 0830 | | | |
| 0900 | | | |
| 0930 | | | |
| 1000 | — | | |
| 1030 | — | | |
| 1100 | | | |
| 1130 | | | |
| 1200 | | | |
| 1230 | | | |
| 1300 | | | |
| 1330 | | — | |
| 1400 | | | |
| 1430 | — | — | |
| 1500 | | — — | |
| 1530 | | — — | — |
| 1600 | | | |
| 1630 | | — | |
| 1700 | | — | |
| 1730 | | — — | |
| 1800 | — | — | |
| 1830 | | | |
| 1900 | | — | |
| 1930 | | — | |
| 2000 | — — | — — — | — — — — |
| 2030 | | — — — — — — — — — — — | — — — — — — — |
| 2100 | | — — — — — — — — — — — — | — |
| 2130 | | | — — — |
| 2200 | | | |
| *Totals* | 7 | 47 | 16 |
| April | 2 | | |
| May | 5 | 25 | 10 |
| June | | 22 | 2 |
| July | | | 4 |

* pursuit songs

from one end of the territory to the other they usually fly between the slopes of the glen where there is a break in the trees. Before the deciduous trees have leafed out in April the birds, when disturbed, will usually seek cover in the hemlocks. Early in the season the waterthrushes feed entirely in the stream. Here they can be seen flipping leaves and picking up the disturbed animals beneath, poking their bills into crannies at the edge of the falls or

FIG. 2. Fall Creek Gorge near Ithaca, New York, a short distance south of Glen No. 1. This glen is much larger than those in the study area.

picking things directly out of the water from a wading approach. Most often they are observed feeding upstream. Later in the season feeding is less restricted to the stream. Often birds will be seen to jump from the floor of the glen and capture insects on the wing, then return to a flat rock along the stream. The birds appear most at ease on the bare, flat rocks of the glen floors where they run in rapid sprints with tail up and head down.

From the start of incubation until the young are fledged the female roosts in the nest at night. Where the male and female roost at other times was not learned, but near dark on several occasions I saw them fly into hemlocks. A young Louisiana Waterthrush which was kept in captivity for a month always picked a site near the ceiling of the room (2 to 3 meters from the floor).

## Nests

In five instances where nest construction was observed both male and female took active parts, but the female was more consistent in her work. Building was watched at various times between the hours of 6:00 and 10:30 a.m. On April 28, 1948, building was observed in Glen No. 8 from 7:25 to 8:43 a.m. At this stage of construction grasses and moss sporophytes were being added and molded into the nest bowl. Nest material was collected within 30 meters of the nest by both members of the pair. During this period of observation the female brought 17 loads and the male 11. Both birds were observed molding the nest material into the bowl, but the female was more thorough in this regard. The bringing of fewer loads by the male does not indicate less activity on his part, for during this time he chased a third waterthrush out of the glen, and also a female Brown-headed Cowbird (*Molothrus ater*) which was watching construction approximately 25 meters from the nest.

On April 26, 1948, nest construction was observed for half an hour near the start of construction. Both birds were dragging wet, muddy leaves into a depression of the bank. Here again the female did much of the work, but the male helped substantially.

Thirteen nests in the Ithaca region were situated on the south sides of ravines, from 0.5 to 4.0 meters above the glen floor. Only three nests were located on the north sides of ravines, and two of these were probably built by the same pair in two successive years. The glen, at the point these nests were located, made an "S" curve and actually ran north and south so that in a restrictive sense the nests were on the east-facing slope of the ravine. In most cases the nests were placed under roots and humus overhanging the banks of the streams, but in two instances they were on small ledges of shale which jutted out from a perpendicular wall.

Nest construction starts with the digging of a shallow cup in the dirt of the bank. Then both partners start hauling in leaves obtained from the surface of the water or from land adjacent to the nest. The cup formed in the bank is filled with these leaves and a few are left in front to form a pathway to the nest (Fig. 3). The number of leaves lining the cup varies considerably, as does the length of the pathway. One nest had leaves arched above

the bowl, and when taken from its location in the bank it looked superficially like the nest of an Ovenbird. The leaves, which constitute the greatest bulk

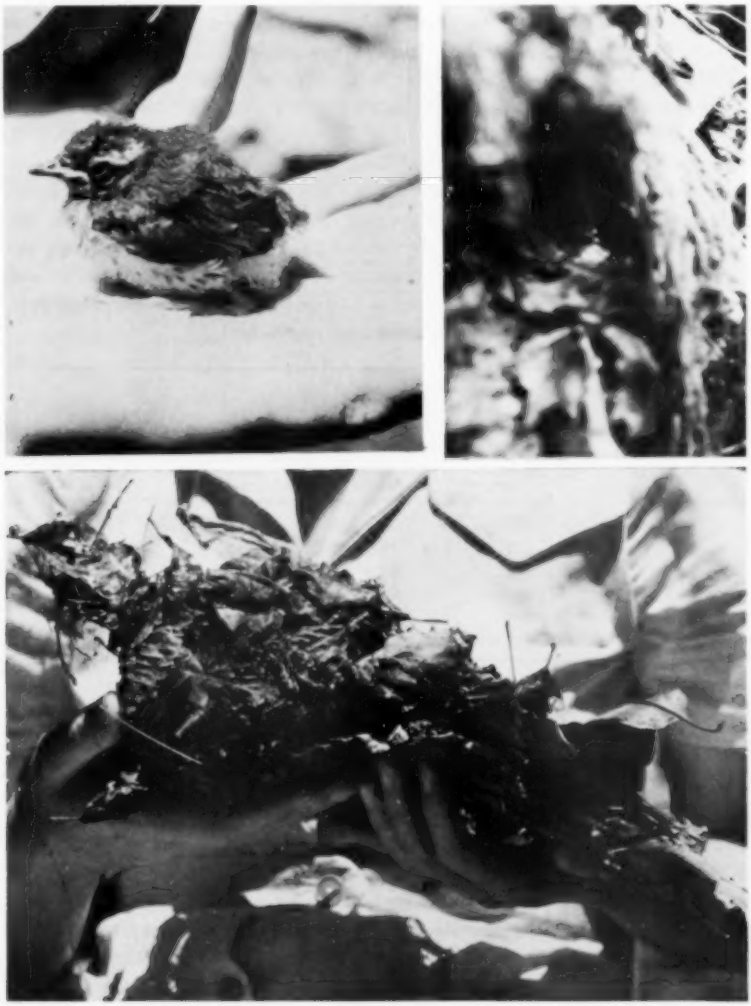

FIG. 3. *Upper left*, Louisiana Waterthrush nestling 10 days old; *upper right*, female incubating with head pointed out entrance. *Below*, side view of nest with pathway on the right and the body of the nest to the left.

of the nest, are continuously molded about the cavity that they fill. In six nests studied carefully, leaves of *Quercus borealis*, *Q. montana*, *Q. alba*, *Ulmus americana*, *U. rubra*, *Acer spicatum* and *A. nigrum* were used. Next, plant stems, pine needles or small hemlock twigs are added to form the outside of the nest bowl. Inside linings are made of small rootlets, small plant stems, horsehair, grass culms or moss sporophytes. One nest about 10 meters away from a discarded chair was lined exclusively with horsehair. Nest sizes are shown in Table 2.

Most first nests were built in the first week of May, but if the first nest was destroyed a second attempt was made. The species is, like the majority of warblers, single-brooded. In 1949 the pair in Glen No. 6 began renesting just one or two days after deserting the first. (I found the second nest with six eggs hatching 18 days after the desertion of the first.) Most nests, except for the lining, are completed in one or two days. The lining is added over a period of two or three days until the first egg is laid.

TABLE 2

MEASUREMENTS OF SIX NESTS COLLECTED AFTER THE NESTING SEASON

| | Inside diameter | Depth of bowl | Over-all width | Over-all depth | Length of pathway |
|---|---|---|---|---|---|
| | 7.5 cm. | 4.0 cm. | 18.0 cm. | 13.0 cm. | 15.0 cm. |
| | 7.5 | 5.0 | 13.0 | 7.5 | 8.0 |
| | 7.5 | 5.0 | 13.0 | 9.0 | 12.0 |
| | 7.5 | 5.0 | 14.0 | 8.5 | 13.0 |
| | 7.5 | 5.0 | 15.0 | 7.0 | 16.0 |
| | 7.5 | 5.0 | 16.0 | 9.0 | 14.0 |
| Average | 7.5 | 4.83 | 14.8 | 9.0 | 13.0 |

## COPULATION

Copulation was seen twice on May 1, 1948, in Glen No. 1. At 10:45 a.m. a female was seen sunning, occasionally preening and scratching her head. At 11:08 she began feeding. At 11:15 she hopped up on a fallen log adjacent to the stream. A male suddenly appeared, chipping loudly. The female crouched on the log and the male mounted with wings vibrating, only partially opened. After two seconds the male flew a few feet away to a shrub, sang once and went back to copulate again. After this action the male flew across the stream. The female sat quietly for a few minutes, then walked up the bank a short distance and started to preen again. At 11:25 she started feeding in the stream again. Five minutes later she started alternately sunning and preening until about 12:00 when she started feeding again. The male

returned about 12:30 p.m. and they flew off together. Two days later I found the nest of this pair approximately 20 meters upstream from the site of copulation; it contained one waterthrush egg and three Cowbird eggs.

## Eggs

Brown-headed Cowbirds made the study of clutch size difficult because they apparently removed waterthrush eggs. Only five undisturbed nests were studied: one held 5 eggs and four held 6 eggs, for an average clutch size of 5.8 eggs (Table 3). The nest with 5 eggs was in Glen No. 1. This

TABLE 3

SUMMARY OF DATA ON NESTS OF THE LOUISIANA WATERTHRUSH

| Year | Location[1] | Eggs | | Young fledged | |
|---|---|---|---|---|---|
| | | Waterthrush | Cowbird | Waterthrush | Cowbird |
| 1947 | 8 | 6 | 0 | 6 | 0 |
| | Cascadilla | ? | (1)[2] | 0 | (1)[3] |
| 1948 | 1 | (1) | 3 | 0 | 2 |
| | 4 | (4) | 1 | 1 | 1 |
| | 5 | 1 | 0 | 0 | 0 |
| | 6 | 6 | 0 | 0 | 0 |
| | 6 (2nd nest) | 5 | 2 | 3 | 2 |
| | 8 | (3) | 3 | 0 | 0 |
| | 9 | (3) | 0 | 3 | 0 |
| | 10a | (5) | 1 | 4 | 1 |
| | 10b | (4) | 1 | 4 | 1 |
| | Coy Glen | 6 | 0 | 6 | 0 |
| 1949 | 1 | 5 | 0 | 5 | 0 |
| | 4 | (2) | 4 | 1 | 3 |
| | 10a | (3) | 2 | 3 | 2 |
| | 10b | 6 | 0 | 6 | 0 |
| Totals | 16 | 60 | 18 | 42 | 12 |

[1] Numbers refer to glens or glen-pairs, and names to those glens outside the study area.
[2] Number of eggs actually laid is unknown.
[3] Successful fledging of young is doubtful.

clutch was completed on May 29, 1949, about three weeks later than the normal first nest. In this case the male was first noted on May 13 and the nest was completed except for the lining on May 23. I believe the male in Glen No. 1 the previous year was killed by a car, because an adult male was found dead by Dr. Brina Kessel Roof not more than 50 meters from the nest. Both parents nesting in Glen No. 1 in 1949 lacked white tipping on the tail, so it was assumed that they were first-year birds which had replaced the pair of 1948 (Table 3).

Near Branchport, New York, on May 17, 1905, C. F. Stone (Unpublished

notes) found four nests in one afternoon and evening. Each of three nests contained 6 Louisiana Waterthrush eggs and one nest contained 3 Louisiana Waterthrush eggs and 1 Cowbird egg.

From these data it appears that 6 eggs is the normal first clutch of undisturbed nests in the central New York region. Chapman (1907:229) said that, in a carefully selected series of 45 sets, four were of 6 eggs, 35 of 5 eggs and six of 4 eggs. The average clutch size of the population in the Finger Lakes region, then, is higher than that reported by Chapman. This may be due to a response to compensate for excessive parasitism by the Cowbird or to the fact that this population is at the northern extremity of the species' range. *Seiurus noveboracensis* in the Ithaca area (Eaton, 1957*b*) was found to have a clutch size of 4.2 eggs (based on nine clutches). There that species is at the southern extremity of its range and is nearly free of parasitism by the Cowbird.

## Incubation

In all cases incubation was done by the female, and she began the day before the last egg was laid. I never collected a male which showed signs of an incubation patch.

Like most ground-nesting birds the female Louisiana Waterthrush is a close sitter, sometimes even allowing one to touch her on the back before she drops to the stream bed with wings and tail spread and feathers of the back elevated. All females observed incubating kept their heads pointed directly out of the nest opening and their tails pointed up at the rear of the nest (Fig. 3). Whenever I approached a nest and moved my head from side to side, a few inches from the female's head, she would slowly turn her head, keeping her bill pointed at the nearest part of my face. Sometimes I could get one to swing her head as much as 60 degrees. This may indicate the species possesses binocular vision rather close to the tip of its bill, an aid in stream-side feeding.

Individual birds varied in amount of injury-feigning shown after leaving the nest. Some left the nest by dropping to the flat rocks and then walked off a short way like a mouse with back slightly hunched, but most birds half-spread the wings and tail and walked down the shallow stream without uttering a sound. When the water level was high, as after a rain, the birds sometimes walked in this manner right up the sides of the steep slopes. One bird observed spread only one wing, but the rest spread both. As incubation progressed there appeared to be an increase in intensity of this behavior.

When approaching the nest during incubation the female flies to a point about 10 meters upstream or downstream from the nest, then walks to a point directly below. From this point she hops either directly to the pathway

leading to the nest or to a point nearby from which she walks to the nest. The "take-off" to the nest from the glen floor is usually made from the same spot each time.

Accurate information on length of incubation (last egg laid to hatching of last egg) was obtained at six nests. Eggs were marked as soon as possible after laying. In four clutches they hatched in 12 days; in one, 13 days; in another, 14 days. The 14-day incubation length was obtained from a nest containing one Louisiana Waterthrush egg and 3 Cowbird eggs (which hatched in 13 days). The young hatch over a 24-hour period, the last egg laid being the last to hatch.

While the female is incubating the male becomes inconspicuous. Sometimes he sings, but never as loudly or as often as before the female arrived. Only once did I see a male feed an incubating female, and this was when the eggs were due to hatch in 24 hours. Chapman (1907:229) quotes a similar observation by Verdi Burtch, "May 21, 1899, I saw a male feeding a female which was sitting on five eggs two of which were hatching." Skutch (1954:383) interprets similar behavior in Central and North American parulids as anticipatory feeding of the young rather than true nuptial feeding. This interpretation seems to contradict the "releaser" concept as described by Tinbergen (1951).

### The Nestlings

After the eggs hatched the female ate the egg shells, usually at the nest. Once a young Cowbird kicked out the shell of a recently hatched waterthrush egg so that it was about six inches from the nest. When the female returned she fed the young in the nest, then picked up the egg shell in her bill, dropped to the stream below the nest and proceeded to eat the shell. She first crushed it with her bill and then ate it in two portions.

When young hatch, their dark grey (almost black) down stays wet for a few hours, and the skin appears much redder than when a day older. The average weight of seven nestlings at hatching was 2.2 grams. One egg just before hatching weighed 2.5 grams. Young hatch with natal down about 10 mm. long in tufts just dorsal to the orbits, in the occipital region, and on the dorsal, humeral, alar and femoral tracts. Down was always absent on the ventral tracts. Soon after hatching the young could raise their heads and gape. Both parents started feeding the young small insects which they brought held cross-wise in the bill. If the female was brooding, the male usually gave the food to her and she rose and fed the young. Both parents ate the feces of the young for the first three days after hatching. On the fourth day the fecal sacs were well formed and were usually dropped in the

stream below the nest before the birds flew to their food-collecting areas. Occasionally, however, they carried them to the food-collecting area.

*Rates of Feeding Young.*—On June 7, 1948, a nest containing two young Cowbirds and five Louisiana Waterthrushes (two of which hatched during the period of observation) was watched between 10:10 a.m. and 12:45 p.m. In this 2½-hour period the young were fed 11 times. The female fed the young 6 times, the male fed them 3 times, and twice the male fed the brooding female which then fed the young. On June 9, 1948, the same nest was observed from 12:35 p.m. to 1:35 p.m., and during this time both parents fed the young a grand total of 10 times. On June 12, 1949, a nest in Glen No. 1 was observed from 4:40 to 6:17 p.m. It held five two-day-old waterthrushes. During the observation period the young were fed 19 times (both parents involved). On June 17, 1948, a nest in Glen No. 10 contained four young waterthrushes, about eight days old, and one young Cowbird. From 11:25 a.m. to 12:25 p.m. the female fed 10 times and the male 9 times.

The following observations were based on 13 nestlings in three different nests, except for those 10 days old.

*One day old*—Average weight 4.1 grams. Feathers of all tracts but the caudal visible beneath the cuticle.

*Two days old*—Average weight 6.4 grams. Sheaths of primaries protruded about 5 mm. from the epidermis. Young capable of righting themselves by using the head, wings and feet. Papillae of rectrices did not protrude.

*Three days old*—Average weight 8.5 grams. Eyes obviously opened at this time. Sheaths of the primaries protruded about 6 mm. Rectrices started to protrude and young seemed stronger and more lively.

*Four days old*—Average weight 10.6 grams. Primaries entirely sheathed and about 12 mm. long. Sheathed feathers of the alula stood out prominently, about 6.5 mm. in length. Their legs were stronger, but the young birds still were unable to sit up.

*Five days old*—Average weight 13.3 grams. Contour feathers of all tracts starting to break through their sheaths.

*Six days old*—Average weight 15.7 grams. Eyes more protruded. Longest primary about 25 mm. Young not yet capable of sitting up on their tarsometatarsi.

*Seven days old*—Average weight 16.9 grams. Young could now sit up on tarsometatarsi.

*Eight days old*—Average weight 16.9 grams. Eyes more protruded. Longest primary averaged 26.0 mm. but still entirely sheathed. Tail wiggled continuously, apparently with the rhythm of respiration.

*Nine days old*—Average weight 17.1 grams. Young just beginning to stand on their toes. Primaries unsheathed for about 14.0 mm. A small amount of natal down left on juvenal feathers, mostly on capital tract. Young occasionally stood up in nest to preen. Some young, if too disturbed, left nest on ninth day.

*Ten days old*—Too few weights for an average but one bird still in the nest weighed 17.1 grams. At five nests where birds were not unduly disturbed and age was known, young left on the tenth day. At this time the parents became greatly excited and bold. When young left the nest they flew a short way and the parents lured them toward the shelter of shrubbery above the stream.

### The Fledglings

For two or three days after leaving the nest the young did not travel far. They were usually found perched in the shrubbery up on the talus slopes. Sometimes they surmounted the crest of the ravine and were found in the oak forest, but this was exceptional. Adults at this time collected food along the stream and flew from there up to the young. In two days the young could fly about 15 meters in sustained flight. When on the ground they walked and moved their caudal region up and down continuously. Once when I startled a young bird it "froze." Soon it became used to my presence and started tail-wagging. If I moved or made a noise it stopped wagging its tail and looked intently in my direction. The *fourth day* out of the nest the young started preening more often, could fly and perch more skillfully, and the rectrices showed about 2 mm. beyond the upper and lower juvenal coverts. After dozing on a perch they stretched by extending both legs to their full length.

On the *fifth day* out of the nest a bird I kept in captivity (called Louie, sex unknown) voluntarily took its first bath. Its rectrices were about 5 mm. longer than surrounding juvenal feathers. The *sixth day* Louie first scratched its head. Louie flew in the characteristic "bounding" flight of the species, similar to that of the Common Goldfinch (*Spinus tristis*). On the *seventh day* out of the nest the primaries exceeded the secondaries by about 10 mm. Louie was taught by Dr. Ernest P. Edwards and Margery Cummings to catch flies which collected at windows. While perched on one's finger it would reach up and dexterously grab the fly in its bill, hold it a few seconds to kill it and then bolt it down. If led to its feeding tray, which was filled with *Chironomus* larvae, it would pick up its own food. Before this time it would not feed itself, but would eagerly devour food stuffed in its mouth with a pair of forceps. The *eighth day* Louie stood on one foot for the first time, and at night was seen roosting with its bill tucked under its scapulars. The *ninth day* Louie followed people around the room and begged for food. At a similar age young waterthrushes in the field were first seen following the adults on their food-searching missions. On the *eleventh day* Louie started feeding more on its own, but would gladly accept food from anyone.

On the *thirteenth day* Louie's tail was about 40 mm. long and all rectrices were coming in simultaneously. The first-winter feathers were first noted as pin feathers on the crural tract. It started to preen and bathe more frequently. Louie's wing (chord measurement) was 75 mm. long. On the *fifteenth day* out of the nest Louie showed first-winter feathers on the outside of the ventral tracts under the bend of the wing. On the *22nd day* Louie was first noted to pull at leaves and flip them over. On the *27th day* Louie was almost indistinguishable from an adult. Its bill measured 10.0 mm.; wing 80.0 mm.; tail 56.0 mm. and tarsus 24.0 mm. The only feathers lacking to complete the first winter plumage were the upper and lower tail coverts and the major coverts. All juvenal major coverts were lost on this day. Louie was released in a local glen and was watched for about half an hour. It immediately started feeding along the stream and seemed in a healthy state.

The sequence of events described above agreed well with observations on color-banded young in the field. The brood from nest No. 10*b* in 1948 was observed from June 18 to July 9 at frequent intervals. For the first 10 days

one parent with two of the four young from this nest could be found within 70 meters of the nest adjacent to the stream. One of these young was last seen being fed by an adult about 100 meters downstream in the same glen on July 9. What I assumed was the other parent was seen feeding one of these four young (color-banded) in Glen No. 7 on July 8 and 9 about 1 kilometer from the nest site. This was about a week before the young had reached the independent stage.

A month after leaving the nest the young birds started to wander unattended by adults. One bird, banded in Glen No. 6 just before leaving the nest on June 12, was seen 4.8 kilometers north on July 19. It remained in this glen for 4 days. Another bird banded as a nestling in Glen No. 9 on June 9, was seen in Glen No. 1 on July 14, 2.0 kilometers from the nest site.

By the middle of July many of the small streams in the area dry up and considerably restrict available feeding habitat. Birds were seen feeding along the lake shore or the woods adjacent to the streams. The greatest concentration of Louisiana Waterthrushes (exclusive of family groups) I have observed anywhere was seven individuals along 100 meters of stream in Chironomus Glen on July 23, 1948. These were independent young and molting adults, and were attracted there by the abundant blood worms (*Chironomus*). Drainage from a large dairy farm caused this unusual concentration of worms and, consequently, of the waterthrushes.

## Food

*Food of Nestlings.*—Two young killed by an unknown predator in a nest in Glen No. 4 on June 4, 1948, contained the following food items in their stomachs (per cent by bulk): one stomach contained 5 per cent gastropods, 5 per cent Coleoptera adults, 5 per cent grit and 85 per cent undetermined insect fragments; the other contained 10 per cent Coleoptera adults, 5 per cent grit and 85 per cent undetermined insect fragments. A Brown-headed Cowbird found dead in a Louisiana Waterthrush nest on July 16, 1947, had in its stomach: 28 per cent Diptera larvae (15 per cent Stratiomyiidae, 3 per cent Tipulidae and 10 per cent unidentified), 10 per cent Diplopoda, 2 per cent Geometridae larvae, 2 per cent Plecoptera, 1 per cent *Asellus*, 2 per cent spiders, 2 per cent Membracidae, 1 per cent Tricoptera, 2 per cent grit and 50 per cent unidentified.

*Food of adults in New York.*—The stomachs of 15 adults were examined (Table 4). These were collected near Ithaca, April through August, 1947–49. The high per cent of occurrence of chironomid larvae was due in part to the fact that nine birds were collected in Chironomus Glen where this food is abundant. Besides dipterid larvae the principal food (as ascertained from the stomachs) was coleopterid adults. Although Plecoptera and Ephemerida

were identified in only one stomach these insects were a favorite food item —particularly during April and May. Often after a "hatch" of these aquatic insects waterthrushes were seen feeding on slow-flying stonefly and mayfly sub-imagos and adults. They take many nymphs too, but at restricted times, i.e. a day or two before a species is due to emerge. Adults also were seen to capture and eat earthworms.

*Food of Adults in Winter and on Migration.*—The food of this bird in Cuba differs markedly from that eaten in New York. In the stomachs of four out of eight birds I collected near Soledad small amphibian bones were present. These were probably small frogs (*Eleutherodactylus* sp.) which were common along the fresh water streams. Crustaceans (probably crayfish), weevils, small aquatic snails and small aquatic beetles were also eaten. Grit was present in seven of the eight stomachs examined.

TABLE 4

FOOD ITEMS FROM 15 ADULT LOUISIANA WATERTHRUSHES TAKEN NEAR ITHACA, APRIL THROUGH AUGUST

| | Average per cent by bulk | Per cent occurrence |
|---|---|---|
| Diptera | | |
| Stratiomyiidae | 44.0 | 13.3 |
| Tipulidae | 5.0 | 20.0 |
| Chironomidae | 40.0 | 73.5 |
| Hemiptera | 5.0 | 6.7 |
| Tricoptera | 42.0 | 13.3 |
| Coleoptera adults (undeter.) | 12.6 | 30.0 |
| Hydrophilidae | 25.0 | 20.0 |
| Elateridae | 3.5 | 13.3 |
| Rhynchophora | 2.0 | 6.7 |
| Neuroptera (*Sialis infumata*) | 35.0 | 6.7 |
| Plecoptera | 40.0 | 6.7 |
| Ephemerida | 45.0 | 6.7 |
| Diplopoda | 20.0 | 6.7 |
| Grit | 6.0 | 54.0 |
| Undetermined fragments (mostly insects) | 58.5 | 94.0 |

Wetmore (1919) reported finding the following items in the stomachs of five specimens collected in Porto Rico: water beetles (Parnidae), leaf beetles, flies, treehopper, spider remains, bits of scorpions, snails, *Eleutherodactylus* and seeds.

Hix (1916) watched a bird in Central Park, New York City, which caught a fish about 1½ inches long. This bird picked off the flesh with its bill. Howell (1932) found the following items in four stomachs of birds collected

in Florida: dragon flies, crane-fly larvae, grouse locusts, beetles, bugs, ants, caterpillars and scale insects. Two of the birds had eaten small mollusks, and one had eaten a killifish (*Fundulus*).

### Parasitism by the Brown-headed Cowbird

Nine of 16 nests (56 per cent) in the Ithaca region were parasitized by the cowbird. These nests contained from one to four cowbird eggs, with a total of 18 eggs (Table 3). Twelve young cowbirds were raised to leave the nine nests. One young was killed by human interference, one young died in the nest (cause unknown), three eggs were deserted (after the female waterthrush was killed), and one egg failed to hatch.

If we assume that the average clutch size of Louisiana Waterthrushes is 5.8 (see page 223), the waterthrushes should have laid 93 eggs in 16 nests. The actual number incubated, however, was only 60 waterthrush eggs. If these assumptions are correct, the cowbirds probably dumped one third of the total from the nests and substituted only 18 of their own. This habit of egg removal by the cowbird is not its only bad one. On one occasion a young cowbird apparently killed three or four young waterthrushes at about the time they would have left the nest. In three other cases young waterthrushes were found below the nest apparently jostled there by their larger (cowbird) nestmates. One of these waterthrushes was six days old when pushed out. When I inspected this nest on June 13, 1948, I found the young bird about six inches below the nest. At first it appeared to be dead, but when I picked it up it moved its limbs slightly. It was cold to the touch and weighed about 4 grams less than the two waterthrushes in the nest. After about a half hour in my hand, it started to revive and soon was begging for food. I returned the young to the nest and in two days it weighed almost as much and appeared as healthy as the other young.

### Fat Deposition

Wayne (1910) said that *Seiurus motacilla* is always exceedingly fat in July and August, but lean in the spring (in South Carolina). Christy (1897) wrote that an adult female which he shot near La Vega, San Domingo, on April 19 was so extraordinarily fat that he had the utmost difficulty in preparing it. Near Gulfport, Mississippi, on October 29 Burleigh (1944) shot a bird which was very fat and apparently normal in every respect. Paul S. Martin (pers. comm.) said he shot a female near Gomez Farias, Tamaulipas, Mexico, in April, 1948, which was "little fat."

The birds which I collected during this study were classified as to amount of fat deposition (Table 5) by the system suggested by McCabe (1943).

From these data it appears that birds start fat deposition in late July and

TABLE 5

FAT CONDITION OF LOUISIANA WATERTHRUSHES COLLECTED IN NEW YORK (APRIL–AUGUST) AND CUBA (DECEMBER–JANUARY)

| | New York | | | | | Cuba |
|---|---|---|---|---|---|---|
| | April | May | June | July | August | Dec.–Jan. |
| no fat | 1 | | 3 | | | 1 |
| little fat | | | | 6 | 3 | 4 |
| moderate fat | | | | | 1 | 2 |

August, following the molt, and during migration are sometimes found in an extremely fat condition. When birds arrive on their nesting grounds they have lost this fat. Birds collected in Cuba in winter showed only a little more fat than they did on their breeding grounds; however, none was collected in winter with a classification greater than "moderate fat."

## WEIGHT

Weights of 22 individuals collected near Ithaca, New York, and six near Soledad, Cuba, show some seasonal variation, correlated with fat deposition and the reproductive cycle (Fig. 4). Although my sample is meager when broken down by sex and month I feel it worth presenting.

## MOLT

*Post-juvenal molt*—This molt involves the contour feathers, the upper and lower tail coverts and the major wing coverts. One from a total of 10 Louisiana Waterthrushes that I collected during the progress of this molt showed evidence of renewal of tail feathers. This bird had one white-tipped tail feather on one side which was one half the length of the others. Similar

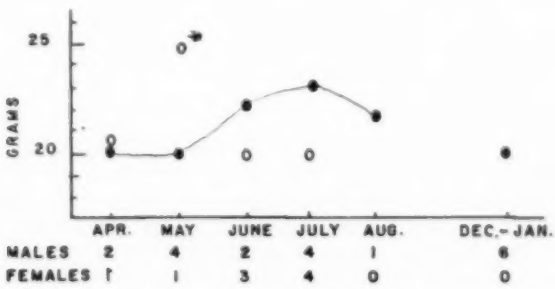


FIG. 4. Weights of adult Louisiana Waterthrushes collected near Ithaca, New York (April–August) and Soledad, Cuba (December–January). * female with egg in oviduct; ● male weights; ○ female weights.

partial replacement of tail feathers in *Seiurus noveboracensis* was noted by Eaton (1957*a*:234). Stewart (1952) in a careful study of this molt in the Yellowthroat (*Geothlypis trichas*) proved this species to have a complete post-juvenal molt. Dwight (1900:282) thought the Yellow-breasted Chat (*Icteria virens*) the only warbler to have a complete post-juvenal molt. Additional selective collecting during the progress of this molt may reveal a greater number of warblers replacing wing and tail feathers as well as contour feathers, especially among ground- and shrub-frequenting species.

FIG. 5. Map showing average first arrival dates for the Louisiana Waterthrush in the United States. Dates above dotted line are average dates for more than five years of observation; dates below dotted line fewer than five years. Data are from the U.S. Fish and Wildlife files.

*Post-nuptial molt*—First evidence of this molt was obtained on July 9, 1948. A female collected near Ithaca was replacing the inner two primaries of each wing. All adults collected later in July were in a later stage of molt. The completion of this molt in the males is often heralded by a recrudescence of song in early August. The Northern Waterthrush (Eaton, 1957*b*) started its molt in the Ithaca region as early as June 9.

## ECTOPARASITES

Peters (1933) lists a tick, *Haemophysalis leporis-palustris*, taken from a Louisiana Waterthrush at Packard, South Carolina. Dr. Elizabeth M. Boyd kindly identified feather

mites which were on all Louisiana Waterthrushes I collected (on primaries 4 and 5). These were *Pterodectes bilobatus* and were also found on *S. noveboracensis* and *S. aurocapillus* (Eaton, 1957*b*). K. C. Emerson identified Mallophaga which I collected from a few specimens as *Bruelia* sp.

## Summary and Discussion

It is of interest to compare the essential differences in breeding biology of the Ovenbird in Michigan (so ably described by Hann) and the Louisiana Waterthrush. Below is a summary of the important dissimilarities brought out by these studies.

| | Ovenbird | Louisiana Waterthrush |
|---|---|---|
| Flight song | frequent | rare |
| Singing after pair formation | often | seldom |
| Territory | rectangular, 0.2–1.8 ha. | 400 meters long, following stream |
| Nest location | under litter of broad leaves | over foundation of broad leaves |
| Nest constructed | by female | by male and female |
| Female's position during incubation | flank toward entrance | head faces out entrance |
| Young first capable balancing on "tarsus" | 4 days | 7 days |
| Young at 8 days | primaries 20 mm. long, over half unsheathed | primaries 26 mm. long, still completely sheathed |
| Young leave nest | at 8 days | at 10 days |
| Males sing after post-nuptial molt | seldom | often |
| Nesting Success | 43.5 per cent of 161 eggs fledged | 70 per cent of 60 eggs fledged |
| First arrives Gulf coast (U.S. Fish and Wildlife files) | April 5 | March 8 |
| First arrives in Michigan and New York | April 29 | April 11 |
| Dates of first eggs | May 23–July 2 | April 30–May 26 |
| First arrives Central America (Skutch, *in* Bent, 1953) | first week October | late August |

Most of these differences can be explained as adaptations for the successful rearing of young in the specific nesting habitat and the utilization of unlike food sources.

Dissimilarities in territory shape may account for the greater attentiveness of the male Louisiana Waterthrush to the female following pair-formation. At this time there is a marked suppression of song in the Louisiana Waterthrush; and the male Louisiana Waterthrush aids substantially in nest building, whereas the male Ovenbird does not. Perhaps the fact that Ovenbird territories are usually surrounded by as many as 4 neighboring males requires

that the male expend more energy in singing to maintain the territory. The Louisiana Waterthrush territory follows the course of a stream so that normally one male must maintain his territory at 2 ends (or against 2 males instead of 4). Territory shape may also have something to do with the near absence of the flight song in the Louisiana Waterthrush. Visual contact of the female by the male following pair-formation seems to be more important here than vocal contact. Nest building by the male and tail-wagging may be added evidence for the importance of this visual contact.

The Buff-rumped Warbler (*Basileuterus fulvicauda*) of Central and South America inhabits the fast flowing stream-sides of montane forests. This warbler belongs to a wide-ranging, flycatching genus of tropical parulids which are mainly arboreal. This species, however, feeds along the stream margin, wags its tail, has a loud voice and both male and female build the nest (Skutch 1954:346–356). These characteristics, which it shares with *Seiurus motacilla*, are examples of convergence—the stream-side habitat being the selective agent.

The nest of the Ovenbird is beautifully concealed on the open floor of the forest by a roof, whereas the Louisiana Waterthrush utilizes overhanging rock ledges or humus and builds a substantial floor of broad leaves for a foundation and pathway to the nest.

The Ovenbird sits sideways to the entrance during incubation perhaps either to conceal the orange crown patch, as suggested by Hann, or because it may have keener monocular vision in this position. The Louisiana Waterthrush female faces directly out the opening and appears to utilize binocular vision while incubating. The white markings above and below the eye and the superciliary stripe help camouflage her in this position.

Incubation lengths did not appear to be different in the two species. Kendeigh's (1952) summary indicates 12 days as an average incubation length in North Temperate wood warblers. Skutch (1954) has discovered that some tropical parulids may incubate up to 17 days.

Ovenbird young leave the nest in eight days whereas the Louisiana Waterthrush left in 10. Nice (1943) suggests such differences are correlated with amount of predation on the nestlings, which view is supported here by the higher percentage of 60 Louisiana Waterthrush eggs successfully fledged.

Motor coordination in the hind limb appears to develop more rapidly in the Ovenbird as Hann's young Ovenbirds could sit up on the "tarsus" in four days and my waterthrushes could not do this until the seventh day. The primaries became unsheathed earlier in the Ovenbird (eighth day or earlier) and not until the ninth day in the Louisiana Waterthrush. However, the latter appears to be able to fly at an earlier age. Motor coordination in the forelimb appears to develop earlier in the Louisiana Waterthrush.

The Louisiana Waterthrush initiates the reproductive phase of its life history about one month earlier than the Ovenbird (Fig. 5). This timing is maintained through nesting, the molt and the return to Central America. This month's difference is certainly now a hereditary one and probably timed to exploit two quite different food sources at the critical time of feeding young in the nest and during the post-juvenal molt. Stone flies, mayflies and other aquatic insects reach a peak of emergence at this latitude about the last week in May and the first week in June. The Louisiana Waterthrush exploits this source. The Ovenbird, along with many other species of the mature broad-leaved forests, exploits the lepidopterid larvae abundant from late June to early August.

## Literature Cited


Bent, A. C.
1953 Life histories of North American wood warblers. *U.S. Nat. Mus. Bull.* no. 203, xx + 834 pp., 22 pl.

Burleigh, T. D.
1944 The bird life of the Gulf coast region of Mississippi. *Occas. Papers Mus. Zool., Louisiana State Univ.*, no. 20:329–490.

Chapman, F. M.
1907 The warblers of North America. New York; D. Appleton and Co., ix + 306 pp.

Christy, C.
1897 Field notes on the birds of the island of San Domingo. *Ibis*, 1897:317–343.

Dwight, J.
1900 The sequence of plumages and moults of the passerine birds of New York. *Ann. New York Acad. Sci.*, 13:73–360.

Eaton, S. W.
1953 Wood warblers wintering in Cuba. *Wilson Bull.*, 65:169–174.
1957*a* Variation in *Seiurus noveboracensis*. *Auk*, 74:229–239.
1957*b* A life history study of *Seiurus noveboracensis* (with notes on *Seiurus aurocapillus* and the species of *Seiurus* compared). *Sci. Studies, St. Bonaventure Univ.*, 19:7–36.

Hann, H. W.
1937 Life history of the ovenbird in southern Michigan. *Wilson Bull.*, 49:145–237.

Hix, G. E.
1916 Louisiana Waterthrush eating fish. *Copeia*, no. 30:31.

Howell, A. H.
1932 Florida bird life. New York; Coward-McCann, Inc., 579 pp.

Kendeigh, S. C.
1952 Parental care and its evolution in birds. *Illinois Biol. Monogr.*, 22:v + 358 pp.

McCabe, T. T.
1943 An aspect of collectors' technique. *Auk*, 60:550–558.

Nice, M. M.
1943 Studies in the life history of the song sparrow. II. *Trans. Linnaean Soc. New York*, 6:viii + 329 pp.

Peters, H. S.
1933 External parasites collected from banded birds. *Bird-Banding*, 4:68–75.
Ridgway, R.
1902 The birds of North and Middle America. *U.S. Nat. Mus. Bull.* 50, pt. 2.
Skutch, A. F.
1954 Life histories of Central American birds. *Pac. Coast Avif.* no. 31:1–448.
Stewart, R. E.
1952 Molting of northern yellow-throat in southern Michigan. *Auk*, 69:50–59.
Tinbergen, N.
1939 The behavior of the Snow Bunting in spring. *Trans. Linnaean Soc. New York*, 5:1–95.
1951 The study of instinct. London; Oxford Univ. Press, 228 pp.
Wayne, A. T.
1910 Birds of South Carolina. *Contr. Charleston Mus.*, 1:xxi + 1–254.
Wetmore, A.
1916 Birds of Porto Rico. *U.S. Dept. Agric. Bull.* no. 326:1–140.

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# FOSSIL BIRDS FROM IDAHO

BY PIERCE BRODKORB

KNOWLEDGE of the fossil birds of Idaho is exceedingly meager. The only records come from deposits along the Snake River, where single species have been identified from American Falls (Howard, 1942), near Bruneau and Grand View (Miller, 1944), Castle Creek (Marsh, 1870), and near Fromans Ferry (Lindgren, 1900). A somewhat larger avifauna, containing five identified species, was described from the vicinity of Hagerman (Wetmore, 1933). Through the kindness of Claude W. Hibbard I am now able to report on additional material from the last-named locality.

The present collection was made by Dr. Hibbard in Twin Falls County, Idaho, about 2½ miles west of Hagerman. Most of the birds were collected in the NW ¼, SW ¼, sec. 28, T. 7 S., R. 13 E., at an elevation of 3025 feet. A cormorant (no. 33908) and a swan (no. 33894) were collected in the NE ¼, NE ¼, sec. 20, at elevations of 3200 and 3150 feet, respectively.

The fresh water lake deposits along the course of the Snake River have been assigned to every epoch from the Eocene to the Pleistocene, but, according to Kirkham (1931) and Stearns (1936), the deposit at American Falls is Pleistocene, and the other avian localities represent the upper Pliocene. Dr. Hibbard, however, believes that the Hagerman lake beds correspond to the Aftonian (first) interglacial stage of the Pleistocene.

## Systematic List

PODICIPEDIDAE, genus indet.

Right quadrate, Univ. Michigan Mus. Paleo., no. 33912. Nearest *Podilymbus*, but with base of orbital process wider and with its medial side more deeply excavated. If not *Pliodytes* Brodkorb (1953), of which only the coracoid is known, it represents an undescribed genus. Wetmore (1933) recorded from Hagerman the head of a femur of a grebe, likewise distinct from any modern genus. Both specimens are of such size that they may be from the same species.

*Phalacrocorax auritus* (Lesson)

Distal portion of left carpometacarpus, no. 33908; proximal portion of left scapula, no. 33913. Both elements agree with modern specimens of the Double-crested Cormorant. Wetmore recorded it from Hagerman on the basis of a tarsometatarsus.

**Phalacrocorax macer**, new species

*Holotype.* Right carpometacarpus (Fig. 1), lacking metacarpals one and three; Univ. Michigan Mus. Paleo., no. 33918. From Hagerman lake beds, in NW ¼, SW ¼, sec. 28, T. 7 S., R. 18 E., Twin Falls County, Idaho; elevation 3025 feet. Collected by Claude W. Hibbard, August 30, 1956.

*Diagnosis.* Resembles living *Phalacrocorax auritus* (Lesson) and *Phalacrocorax wetmorei* Brodkorb, 1955, from the Bone Valley Pliocene of Florida, but slightly smaller; cuneiform fossa deep but much shorter, extending proximad only to level of external

ligamental attachment; distal fornix shorter. Length, 67.5 mm.; width of metacarpal II, 4.5; width through trochleae, 5.6; width of distal end, 5.7; distal fornix, 6.0.

Wetmore (1933) reported the heads of two coracoids slightly smaller and more slender than in *P. auritus*. They are thought to represent the species here described.

**Cygnus hibbardi**, new species

*Holotype.* Left tarsometatarsus (Fig. 1); Univ. Michigan Mus. Paleo., no. 33894. From Hagerman lake beds, in NE ¼, NE ¼, sec. 20, T. 7 S., R. 13 E., Twin Falls County, Idaho; elevation 3150 feet. Collected by Claude W. Hibbard, August 30, 1956.

*Description.* Anterior proximal fossa shallow; peroneal groove shallow; external ligamental prominence reduced; shaft stout, nearly same width throughout, without marked proximal swelling, submedial tapering, or distal flaring; anterior face of shaft with external edge smoothly rounded, nearly straight; internal superior foramen opening on anterior face at level of external foramen; first hypotarsal canal roofed; junction of second and third hypotarsal crests not forming a keel on shaft; third hypotarsal crest reaching level of external superior foramen; fourth hypotarsal crest ending above foramen. Proximal width, 24.0 mm.; width at level of proximal end of tubercles for tibialis anticus, 14.7; width at distal end of tubercles, 12.1; least width of shaft, 10.1.

*Diagnosis.* Differs from living *Cygnus buccinator* Richardson in being smaller; peroneal groove shallow; internal superior foramen low.

Agrees with living *Cygnus columbianus* (Ord) in size but peroneal groove shallow; shaft stout; internal superior foramen low. In both living species there is a tendency for the fourth hypotarsal crest to send a slight keel above the foramen, and both often have the first hypotarsal canal unroofed.

Agrees in size with *Cygnus paloregonus* Cope (1878) of the Pleistocene of Oregon but differs in having anterior proximal fossa shallow; peroneal groove shallow; external ligamental prominence reduced; shaft stout; boundary between anterior and external sides of shaft without a sharply ridged, curved line; second and third hypotarsal crests not forming a keel on shaft; third and fourth hypotarsal crests not extending beyond foramen. A cast of Cope's type, which is now no. 3552A in the American Museum of Natural History, was supplied through the kindness of Mrs. Rachel H. Nichols.

*Referred material.* Proximal portion of left femur, with the same catalog number as the type. Differs from *C. buccinator* and *C. columbianus* in having anterior intermuscular line flaring abruptly mediad after leaving trochanteric ridge. Agrees with *C. buccinator* in having trochanteric ridge less curved than in *C. columbianus*, with proximal portion of bone thus wide. Femur of *C. paloregonus* unknown. Size intermediate between the two living species. Proximal width, 27.7 mm.; head to trochanteric crest, 24.1; width below head, 22.0; least width of shaft, 12.7; anteroposterior depth of head, 13.3.

Wetmore (1933) recorded from Hagerman some indeterminate fragments of a swan the size of *C. columbianus*, possibly the species described above.

Lindgren (1900:99) reported a fossil swan from near Fromans Ferry, Idaho, as "*Olor*, size of *O. paleocygnus*." This apparently is a *lapsus calami*, for *paloregonus*, as first pointed out by Wetmore (in Hay, 1927:267). The specimen in question is a cervical vertebra, now U.S. Nat. Mus. no. 11608. *Olor paleocygnus* is a *nomen nudum* without any standing in nomenclature.

*Anas platyrhynchos* Linnaeus

Distal end of right tarsometatarsus, no. 33914. The mallard was hitherto unknown from the Hagerman lake beds, although widely recorded from the Pleistocene of North America, Europe, and Asia.

*Bucephala* sp.

Distal portion of left carpometacarpus, no. 33921. Larger than the metacarpus of modern *Bucephala albeola* and differing in other details. The only fossil member of this genus is *Bucephala ossivallis* Brodkorb (1955), from the Bone Valley formation, but as only the coracoid of that species is known, direct comparison is not possible.

FIG. 1. *Left to right: Phalacrocorax macer*, n. sp., holotype carpometacarpus, × 1; *Cygnus hibbardi*, n. sp., referred femur and holotype tarsometatarsus, both × 0.9; *Porzana lacustris*, n. sp., holotype humerus and referred coracoid, both × 2.7. Photographs by Robert D. Weigel.

**Porzana lacustris**, new species

*Holotype.* Right humerus, lacking the proximal end (Fig. 1); Univ. Michigan Mus. Paleo., no. 33916. From Hagerman lake beds, in NW ¼, SW ¼, sec. 28, T. 7 S., R. 13 E., Twin Falls County, Idaho; elevation 3025 feet. Collected by Claude W. Hibbard, August 30, 1956.

*Diagnosis.* Differs from living *Porzana carolina* (Linnaeus), *Porzana guti* (Brodkorb, 1952), and *Porzana auffenbergi* Brodkorb (1954), the latter two both from the Illinoian stage of the Pleistocene of Florida, as follows: entepicondyle straighter, wider, not

coming to a rounded point; ectepicondylar process more rounded and less produced; size larger. Distal width, 6.0; width of shaft, 2.7 mm.

Larger than *Rallus prenticei* Wetmore (1944) from the upper Pliocene of Kansas, besides differing in generic characters. The humerus of *Porzana* differs from that of *Rallus* in having the entepicondyle produced, with a notch separating it from the internal condyle; external condyle scarcely bent.

The new species is much smaller than other American fossil rails.

*Referred material.* Upper half of left coracoid, no. 33915. This element is tentatively referred, as it comes from a rail of about the same size as the type. It agrees with *Porzana* in having a very wide shaft, but differs in that the brachial tuberosity has even less of an overhanging lip than in *Rallus*.

The fragmentary metacarpal reported by Wetmore may likewise represent the same species.

## Age of the Hagerman Lake Beds

The avifauna of the Hagerman lake beds is now known to include at least 16 species, but unfortunately only nine have thus far been determined at the specific level. These are as follows:

a. Known only from Hagerman: *Pelecanus halieus*, *Phalacrocorax macer*, *Cygnus hibbardi*, *Chen pressa*, *Porzana lacustris*.

b. Known also from Castle Creek, Idaho, and the Bone Valley formation, Florida: *Phalacrocorax idahensis*.

c. Living species widespread in the Pleistocene: *Phalacrocorax auritus*, *Anas platyrhynchos*, *Gallinula chloropus*.

In addition, two grebes, another swan, three more ducks, and a crane have been reported from the Hagerman local fauna, but have not yet been identified. There are, however, indications that at least two members of the undetermined group may be identical with species described from the Bone Valley formation, which is ordinarily assigned to the middle or lower Pliocene.

Living species of birds apparently are absent from deposits before the upper Pliocene (Brodkorb, 1955). As the Hagerman lake beds contain extant species, the maximum possible age of the beds is upper Pliocene.

Among the determined species from Hagerman the proportion of extinct forms (67 per cent) is much higher than that which occurs in late or middle Pleistocene deposits but is similar to the proportion from deposits referred to the upper Pliocene or earliest Pleistocene (Brodkorb, 1955, 1957).

There appears to be a trend toward small size in the Hagerman avifauna, exemplified by *Pelecanus halieus*, *Cygnus hibbardi*, and *Chen pressa*. The data are inconclusive at present, but if this tendency should be substantiated by additional material, it could be interpreted as reflecting the warm climate of a preglacial or interglacial stage through operation of Bergmann's rule.

The evidence at hand thus indicates that the Hagerman lake beds were

formed during either the upper Pliocene or the first interglacial stage of the Pleistocene.

### Age of Other Snake River Beds

The avifaunas from other parts of the Snake River plain are more poorly known than that of Hagerman. The only bird from Fromans Ferry is a swan of questionable determination. The single species from Castle Creek is the extinct *Phalacrocorax idahensis*, which has been recorded from Hagerman and the Bone Valley formation. The only bird determined from Grand View is the living *Grus americanus*, widespread in the late Pleistocene and presently on the road to extinction. The only species identified from Bruneau or American Falls is the extinct stork, *Ciconia maltha*, whose type locality is in the late Pleistocene of California.

Obviously more information is needed, but the presence of late Pleistocene species at American Falls, Bruneau, and Grand View suggests that these deposits may be younger than those at Castle Creek and Hagerman, from which no late Pleistocene indicators are known but which contain at least one Pliocene form.

### Literature Cited

Brodkorb, P.
1952 A new rail from the Pleistocene of Florida. *Wilson Bull.*, 64:80–82.
1953 A Pliocene grebe from Florida. *Annals Mag. Nat. Hist.*, ser. 12, 6:953–954, fig.
1954 Another new rail from the Pleistocene of Florida. *Condor*, 56:103–104.
1955 The avifauna of the Bone Valley formation. *Florida Geol. Surv., Rep. Invest.*, 14:1–57, 11 pl.
1957 New passerine birds from the Pleistocene of Reddick, Florida. *Jour. Paleo.*, 31:129–138, pl. 20, text-fig. 1.

Cope, E. D.
1878 Descriptions of new extinct Vertebrata from the upper Tertiary and Dakota formations. *Bull. U. S. Geol. Surv.*, 4:379–396.

Hay, O. P.
1927 The Pleistocene of the western region of North America and its vertebrated animals. *Carnegie Inst. Wash. Publ.*, 332B:1–346, pl. 1–12, text-figs. 1–19.

Howard, H.
1942 A review of the American fossil storks. *Carnegie Inst. Wash. Publ.*, 530:187–203, pl. 1, text-figs. 1–2.

Kirkham, V. R. D.
1931 Revision of the Payette and Idaho formations. *Jour. Geol.*, 39:193–239, figs. 1–16.

Lindgren, W.
1900 The gold and silver veins of Silver City, DeLamar and other mining districts in Idaho. *U. S. Geol. Surv., Ann. Rept.*, 20, pt. 3:65–256, pl. 7–35.

Marsh, O. C.
1870 Notice of some fossil birds, from the Cretaceous and Tertiary formations of the United States. *Amer. Jour. Sci.*, ser. 2, 49:205–217.

Miller, L.
1944 Some Pliocene birds from Oregon and Idaho. *Condor*, 46:25–32.
Stearns, H. T.
1936 Origin of the large springs and their alcoves along the Snake River in southern Idaho. *Jour. Geol.*, 44:429–450, figs. 1–8.
Wetmore, A.
1933 Pliocene bird remains from Idaho. *Smithsonian Misc. Coll.*, 87(20):1–12, figs. 1–8.
1944 Remains of birds from the Rexroad fauna of the upper Pliocene of Kansas. *Univ. Kansas Sci. Bull.*, 30:89–105, figs. 1–19.

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# FURTHER ORNITHOLOGICAL NOTES FROM ZACATECAS, MEXICO

BY J. DAN WEBSTER

THE west-central Mexican state of Zacatecas has seldom been mentioned in ornithological literature. The proof of this statement lies in the 48 state records which appear below. Yet I believe that all of these species are locally common, or at least regular in occurrence.

Wollweber collected in Zacatecas in the early nineteenth century; Nelson and Goldman worked extensively in the western part of the state (Goldman, 1951); and Chester Lamb collected moderately in the state for the Moore Collection of recent years (Miller *et al.*, 1957). But references to their collections are brief and scattered through the literature, and the only ornithological writings dealing specifically with this area are those of the writer (Webster and Orr, 1952 and 1954; Webster 1954*a*, 1954*b*, 1956).

Herewith I present new findings from trips made in 1954 and 1955, together with a few observations from 1950 and 1952. In 1954 I studied in the state from June 17 to July 29, visiting almost every locality shown in Fig. 1; I was assisted by Mr. Robert H. Brewer, who was, however, primarily collecting insects. In 1955, I was accompanied by Dr. Allan R. Phillips; we worked in Zacatecas from September 5 to 29.

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I want to thank many people. Dr. Robert T. Orr and the rest of the staff of the California Academy of Sciences helped me at every stage. Dr. Allan R. Phillips not only did a substantial part of the field work reported, but also several of the identifications, as noted below. Drs. Alden H. Miller and Frank A. Pitelka not only allowed me free access to the Museum of Vertebrate Zoology, but loaned many specimens for use in San Francisco and permitted me to report several specimens from the collections under their care. Dr. Kenneth C. Parkes of the Carnegie Museum loaned me several specimens for comparison. Mr. Robert H. Brewer was a helpful, cheerful assistant in the field. Sr. Anhelm Mier permitted us to camp and collect on his hacienda at Laguna Valderama, as did Sr. Miguel Zorilla Silva near Chalchuites. The authorities of the Mexican Department of Forestry and Game courteously granted me collecting permits. Lastly, I want to acknowledge the financial help of the California Academy of Science during my field work in 1955, and similar financial aid by the Hanover College faculty research fund for my field work in 1954.

The Sierra Madre Occidental, in which all of this area is included, is not a continuous mountain range in Zacatecas. Especially is this so in the region of the southeastward-trending continental divide, where broad, flat valleys alternate with isolated mountains, as near Zacatecas City. Further south and west, there is rugged canyon and mesa country, with great canyons leading

south-southwest into the Rio Grande de Santiago in Jalisco, and separated by flat-topped mesas which are most precipitous on their western and southern slopes. The climate of western Zacatecas is varied; the low country near Moyahua is frost-free and has a yearly average temperature of about 22°C., whereas there are frequent frosts and an annual average of 13°C. at Zacatecas City. The annual rainfall, 91 per cent of which falls between June 1 and December 31 (Anonymous, 1939), varies from 15 inches at Zacatecas City to about 36 inches at the most humid point visited, 13 miles west of Milpillas. In general, there is a trend of decreasing moisture from the west toward the east.

The vegetation has been studied by Shreve (1942) and Gentry (1946 MS); these botanists, however, did not visit the deep western canyons. A rough ecological classification of western Zacatecas, following, for the most part, Gentry (1946) and Leopold (1950), divides the land into three categories: (1) Grassland at elevations from 6,000 to 8,000 ft., with annual rainfall from 15 to 25 inches. The dominant grasses are species of *Bouteloua*, which form pure short-grass plains in flat and more humid areas where grazing is light. Slopes and overgrazed or eroded areas are grown to oak (*Quercus*) woodland or junipers (*Juniperus*) and/or piñons (*Pinus edulis*) forming a low scrub or a woodland, or, in drier areas, to cactus–acacia–mesquite (*Opuntia–Acacia–Prosopis*) scrub. The drier grassland areas have a savannah-like formation on flat or gently sloping ground called cactus–acacia grassland; here large *Opuntia* cacti and acacia trees are scattered on a short-grass plain. (2) Pine–oak forest and woodland, at elevations from 7,000 to 11,000 ft. (not on level areas below 7,400 ft.), with annual precipitation from 25 to 36 inches. (3) Tropical deciduous woodland, at elevations from 4,200 to 5,100 ft. in deep canyons of the Pacific slope, with an ecotone with grassland which carries some morning glory trees (*Ipomoea*) upward to elevations of 6,300 ft. Climax woodland consists of morning glory trees, *Jatropha*, *Bursera* (at least two species) and other unidentified trees with a scattering of large candelabra cacti (*Pachycereus*). Cypresses (*Taxodium*) are found along the rivers; large mesquite trees (*Prosopis*) are prominent along waterways and the edges of sugar cane and cornfields, while eroded slopes and abandoned fields support a dense thorny scrub chiefly of *Acacia*.

Localities mentioned in the systematic list are shown on the accompanying map (Fig. 1) and may be briefly described thus (all distances in air line miles):

Cerro Gordo is 9 miles northwest of Sombrerete; considerable work was done in 1952, 1954, and 1955 around a camp in sparse piñon–juniper woodland at 7,900 ft., 3 miles east of the peak.

Sombrerete is a city in the grassland of northwestern Zacatecas; study

here was chiefly in July, 1950, 4 miles south of town in cactus–acacia–mesquite scrub at 7,600 ft.

The Rio Atotnilco crosses the highway a mile southwest of the town of Sain Alto; some collecting was done here in June of 1952 and 1954 in the riparian cottonwood–willow (*Populus–Salix*) association at 6,800 ft.

The Rio Florido (= Trujillo) crosses the highway 15 miles northwest of Fresnillo. Field work in the cottonwood–willow along the river a mile north

FIG. 1. Outline map of the state of Zacatecas, Mexico, showing localities mentioned in the text and routes traveled in 1950, 1952, 1954, and 1955. Bordering states are labeled. The El Paso–Mexico City highway (Nacional 45) is shown entering northwest of Cerro Gordo and leaving southeast through Aguascalientes. Figures denote the following localities: 1—Cerro Gordo; 2—Sombrerete; 3—Sain Alto; 4—Fresnillo; 5—Ciudad Zacatecas; 6—Creek 9 miles west of Zacatecas City; 7—Chalchuites; 8—Zorilla's; 9—Laguna Valderama; 10—Milpillas; 11—Camp 13 miles west of Milpillas; 12—Rancho Hornillas; 13—Garcia (= Jerez); 14—Tepetongo; 15—Huejucar; 16—La Mesa; 17—Santa Teresa; 18—Monte Escobedo; 19—Colotlan; 20—Momax; 21—Tlaltenango (= Sanchez Roman); 22—Villanueva; 23—Jalpa; 24—Apozol; 25—Juchipila; 26—Moyahua.

of the bridge and in the cactus–acacia–mesquite scrub (elevation 6,600 ft.) was on scattered days in June and July, 1952, and 1954.

Fresnillo is an old mining city at 7,300 ft. in cactus–acacia grassland that has been much modified by man.

Zacatecas City, the capital of the state, is a mining center four centuries old; the center of town is at 8,100 ft. Goldman (1951) states that the locality is very arid, no doubt basing his statement on the appearance of the vegetation, which is sparse cactus–acacia scrub. Actually the annual rainfall is recorded to average 15 inches, and the primeval vegetation of the townsite was no doubt grassland, with the surrounding peaks supporting oaks and perhaps pines. I attribute the present appearance to deforestation, overgrazing, and accelerated erosion, as does Leopold (1950). Work near here was at a creek 9 miles west of town, bordered with cottonwood, willow, and *Baccharis* brush in the grassland at 7,400 ft.

Chalchuites is a town in the grassland at the western foot of Cerro Pachon. Driving south and west from here, across a broad, cultivated valley, we ascended through piñon–juniper woodland and camped at 8,400 ft. in oak woodland on a ridgetop 8 miles south-southwest of town. Other higher ridges to the south and west reached 9,200 ft. and bore pine forests. We were here, on the hacienda of Sr. Miguel Zorilla Silva, from July 2 to 5, 1954; the locality is referred to hereafter as Zorilla's.

Laguna Valderama is a short-grass plain or prairie at 7,800 ft., 40 miles west of Fresnillo. Our camps in 1952 and 1954 were southeast of the prairie in mixed pine–oak–juniper woodland and Chihuahua pine (*Pinus chihuahuana*) forest. There are several seasonal ponds in the oak savannah country southwest of Laguna Valderama (on the road to Milpillas), one of them attaining a mile in length. The ponds were dry mud in June, but filled with water in July, and later in the rainy season (September 28) they were deep and clear, with considerable emergent aquatic vegetation.

Milpillas is a village in oak savannah country at 7,800 ft., 52 miles west of Fresnillo. Our study area in June and July, 1954, and September, 1955, was to the west, along the top of an irregular mesa from 8,200 to 8,400 ft. Scattered Chihuahua pines appear 3 miles west of Milpillas, mixed pine–oak woodland in another mile, and pine forest of Chihuahua and Apache pines (*P. latifolia*) after 10 miles. We camped as far as 13 miles west of Milpillas, and walked another mile beyond. There has been extensive cutting for charcoal burning of the oaks on this mesa, but lumbering did not begin until 1955 because few of the pines were large. Timber-cutting activity is still sporadic. Grazing pressure is uneven, with some areas intensively overgrazed and other areas supporting luxuriant bunch grass and other ground cover.

Ernest P. Edwards and Stephen S. Russell visited Rancho Hornillas in July 1950.

Garcia (= Jerez) is a city in the grassland at 6,800 ft., 28 miles west of Zacatecas City. We followed down the broad Jerez Valley south to the towns of Tepetongo, 6,600 ft., and Huejucar, Jalisco, 6,400 ft. Water birds were observed on the mile-long reservoir beside Tepetongo. On July 15, 1954, we continued on south through Colotlan, Jalisco, to Tlaltenango (= Sanchez Roman), Zacatecas. Our camps the next two days were 7 miles north of Colotlan, at 6,100 ft. in morning glory trees mixed with high mesquite–acacia–cactus scrub, and a mile south of the village of Momax, beside the Rio Tlaltenango at 5,600 ft. At the Momax camp, collecting was in the bottomlands along the river, where thickets of willow alternated with wet pastures and cultivated fields of sugar cane and chile peppers.

From Huejucar a truck trail leads west, up onto the mesa at 7,400 ft. at the village of La Mesa. From here a plain sweeps west and north for many miles, with nothing breaking the prairie vista but an occasional stone wall. However, in two arroyos below the mesa level there is oak woodland. The track winds west, gradually descending across the prairie to the village of Santa Teresa, at 6,500 ft., and then on west and up a series of steps to Monte Escobedo; oak woodland begins at 7,400 ft., 3 miles east of the town of Monte Escobedo. Up on the mesa west of the town (7,700 to 8,000 ft.) the woodland consists of a very large-leafed oak, with some weeping pines; further west Chihuahua pine and Apache pine appear and the very large-leafed oak is replaced by a small-leafed species. At its western face, 8 miles west of town, the mesa drops precipitously into the great barranca of the Rio Bolaños. We climbed down the cliffs in several places and found varied conditions—dry manzanita (*Arctostaphylos*) brush and rocks at one point; pine forest on one shady slope, oak woodland at another place, large oaks draped with moss and epiphytes shading a brush-choked ravine and cascade. Our camps near Monte Escobedo were 4 and 5 miles west of town, respectively, and we worked chiefly about those areas and on the western slope in July, 1954, and September, 1955.

Villanueva is a town in southwestern Zacatecas at 6,600 ft. Thence the road extends southward down the valley of the Rio Malpaso and its continuation the Rio Juchipila to Moyahua, 81 miles below at 4,200 ft. Patches of morning glory trees appear at about 6,300 ft., 10 miles below Villanueva, and candelabra cacti a few miles further on, but well-developed deciduous woodland does not begin until one nears Jalpa, 5,000 ft., along with sugar cane cultivation. Jalpa, Apozol, Juchipila, and Moyahua are the towns of the lower valley, Juchipila being the largest, and the capital of the district. Our main camp in the area was 2½ miles north of Moyahua, at 4,300 ft., beneath

a large mesquite tree and near fields of corn and squash. A trail leads from our campsite to the river, 400 yards away, through a steep-walled ravine between hills. The hills are grown with tall, coarse grass on the ridges; brush on some slopes, and deciduous woodland on some slopes and in ravines. Along the river there are cypresses on the deep side and large mesquites back from the gravel bar on the shallow side.

## Systematic List

The following list of species includes only those forms collected in 1954 and 1955 which represent new information. State records for Zacatecas are indicated by an asterisk (*). Unless otherwise stated, dates in June and July are for 1954; dates in September are for 1955. All specimens referred to are now in the collection of the California Academy of Sciences, except those which are stated to have been taken by Phillips, which are now in the personal collection of Allan R. Phillips. Except where stated otherwise, localities are in Zacatecas. Measurements are in millimeters.

**Plegadis falcinellus chihi.* White-faced Glossy Ibis.—On July 13 an adult with two young was in a pond between Laguna Valderama and Milpillas. The adult, a male, and a yearling male were collected. On July 18 one flew down the river past our camp at Momax.

**Florida caerulea caerulea.* Little Blue Heron.—Two stuffed specimens were examined in a taxidermist's shop in Juchipila. Both were in the white immature plumage; both were said to have been taken on the bank of the river at the edge of town in March, 1955.

**Aquila chrysaetos canadensis.* Golden Eagle.—One seen at close range in the oak-savannah five miles south of Laguna Valderama on July 3 was perched in an oak bush. A large collection of eagle talons from eagles shot at Laguna Valderama was shown to me by Señor Anhelm Mier in June. All of them appeared to belong to the Golden Eagle, which was said to be a serious predator on calves. On September 24 we examined a recently killed adult specimen at Laguna Valderama.

**Accipiter striatus suttoni.* Sharp-shinned Hawk.—I saw one July 3 at Zorilla's, hunting along a pine-clad ridge. Phillips collected an adult male, September 25, 8 miles west of Milpillas. Phillips identified the specimen.

**Colinus virginianus graysoni.* Bobwhite.—We very commonly saw and heard Bobwhite in the cornfields, the tall weeds and grass, and the scattered mesquites and acacias in the valley of the Rio Juchipila from 6,100 ft., 12 miles south of Villanueva, to Moyahua, July 25 to 27 and September 7 to 13; we took five specimens. On July 17 and 18 several were seen, and more heard in similar habitat in the valley of the Rio Colotlan, from 5,600 ft. at Momax to 6,400 ft., 9 miles north of Colotlan, Jalisco. A female taken at the last locality, July 18, had a shelled egg in her oviduct.

**Meleagris gallopavo.* Wild Turkey.—We saw fresh tracks in a dry creek bed at Laguna Valderama, June 21 and 23, and picked up a freshly molted primary on June 23. We heard the gobble in oak woodland at Laguna Valderama July 8, and saw one bird in similar habitat 13 miles west of Milpillas on July 13.

**Fulica americana americana.* American Coot.—There was one on the Rio Florido June 20, and September 15 there were six on the Tepetongo reservoir. On the ponds between Milpillas and Laguna Valderama on September 28 we took a single and saw a flock of 15.

**Tringa solitaria solitaria.* Solitary Sandpiper.—One was taken at a small tank in the juniper–piñon area at Cerro Gordo, September 6. Later, the species was seen by ponds in the open short-grass plains—two in Jalisco, 3 miles west of La Mesa, September 15; one at Laguna Valderama, September 28; one September 28, 21 miles west of Fresnillo.

**Columbigallina passerina passerina.* Common Ground Dove.—We saw many in the Juchipila valley, July 25 to 27 and September 6 to 13, from 15 miles south of Villanueva to Moyahua; a specimen was taken at Moyahua, July 26. In addition, several were seen at Momax, July 17 and 18, and from one to three each day spent at the Rio Florido, between June 20 and July 25, 1952, as well as 1954.

*Tyto alba pratincola.* Barn Owl.—Previously (Webster and Orr, 1952) we reported sight records from Sombrerete. None was seen or heard in 1954, but I heard one at Rio Florido, July 17, 1952, and September 10, 1955, one at Moyahua. Two specimens were examined in a taxidermist's shop in Juchipila; they were said to have been taken in that town.

**Otus asio.* Common Screech Owl.—At Moyahua, there were several in the mesquite trees along the gullies, September 9 to 11. I compared all three specimens with the three fresh-plumaged specimens of *suttoni* (from Chihuahua and Durango) in the Museum of Vertebrate Zoology; found that they were browner and darker, less gray, both ventrally and dorsally, two slightly so and one definitely; and concluded that they represented the race *O. a. sortilegus* Moore, 1941, described from Atoyac, Jalisco. However, Dr. Alden H. Miller very courteously consented to study them. He writes, "Two of your Zacatecas owls seem so close to *suttoni* as to be inseparable. A. R. P. 3974 looks significantly darker and a bit browner and I suppose represents *sortilegus*, which we have not seen."

**Micrathene whitneyi idoneus.* Elf Owl.—During the evening of September 11, at Moyahua, Phillips collected a Screech Owl in a mesquite tree. Before he could reload, an Elf Owl alighted in the glare of his headlight in the same tree, to be dispatched by Webster. The specimen (an adult female) was compared with three fall *whitneyi* from Arizona, an adult male *whitneyi* from Arizona, an adult *whitneyi* from Chilpancingo, Guerrero, November 30, 1940 (Mus. Vert. Zool.), and an immature *whitneyi* from Pacheco, Chihuahua, August 18, 1948 (Mus. Vert. Zool.). The Zacatecas bird is a darker, more chestnut shade of brown on the upper parts, the brown part of the tail and the facial markings, and the tail markings are fewer, smaller and more sharply contrasting. Until more material is available I follow Ridgway (1914) and recognize an eastern race. Whether the species is a transient, a resident, or winter visitant at Moyahua is anybody's guess. In passing, I note that the species has not been reported previously either from Chihuahua or Guerrero.

**Phalaenoptilus nuttallii centralis.* Poor-will.—An immature female was taken on July 12, 13 miles west of Milpillas, in pine forest at the edge of a barranca. Earlier, the call of the species was heard almost every evening, July 13 to 23, 1950, at Sombrerete in mesquite–cactus–acacia scrub; July 12 to 16, 1952, and June 20 to 24, 1954, at Laguna Valderama on a rocky hillside in the grassland–pine–oak ecotone; and July 4, 1954, at Zorilla's, in oak woodland.

**Caprimulgus vociferus oaxacae.* Whip-poor-will.—From one to five were heard calling each night spent in the pine–oak area in June and July—at Valderama (1952 as well as 1954), Monte Escobedo, and west of Milpillas. On June 27, 9 miles west of Milpillas, two nearly-grown young, able to fly but a few feet, were accompanied by both parents, although only the mother feigned injury. Phillips heard one calling early in the morning of September 17 near Monte Escobedo. On September 25, three called briefly as I

tramped around on an extended night hunt from our camp 8 miles west of Milpillas. A male taken September 17 at Monte Escobedo and a male taken July 10, 13 miles west of Milpillas, are both intermediate between *C. v. oaxacae* and *C. v. arizonae*. However, the freshly-plumaged bird is clearly nearer the darker southern race, whereas the worn July bird is equivocal.

**Caprimulgus ridgwayi ridgwayi*. Ridgway Whip-poor-will.—On September 8 at Moyahua, this species called briefly in the evening; Phillips took two males, that night and September 11, on the large bare area provided by an ant hill. Phillips writes, "The specimens are slightly darker, particularly on the crown, than two males from Sonora, but this may be seasonal."

**Cypseloides niger costaricensis*. Black Swift.—We saw from two to eight each day, 4 miles south of Jalpa and at Moyahua, September 8 to 13. Near Monte Escobedo, a flock of 20 circled over us on September 16. Phillips collected one near Jalpa, and Webster three at Moyahua. One Durango specimen (previously recorded as *C. n. borealis* by Webster and Orr, 1952) and the four Zacatecas specimens were compared with four *costaricensis* from Costa Rica (Carnegie Mus.). Also at hand were four June specimens from the State of Mexico (Mus. Vert. Zool.) and a migrant taken on the Pacific Ocean off Guatemala, September 20, 1933 (recorded previously by Davidson, 1934), plus an extensive series from Alaska, British Columbia, and California. All the Mexican birds at hand are *costaricensis*, although the specimen taken "at sea" is *borealis* as originally reported. Mexican birds are closer to *borealis* in the restriction of the ventral white markings and the lesser extent of white frosting on the head, but closer to *costaricensis* in wing and tail lengths. The color of back and belly is as black as *costaricensis* and blacker than *borealis* in each case.

Summary of measurements of specimens examined:

| | *wing* | *tail* |
|---|---|---|
| 10 males, *borealis*, Alaska, British Columbia, California | 162–170 (165.5) | 57–62 (59.7) |
| 6 males, *costaricensis*, Estado de México, Zacatecas, Durango | 158–163 (161.0) | 53–57 (55.7) |
| 2 males, *costaricensis*, Costa Rica | 158–165 (161.5) | 56–58 (57.0) |
| 14 females, *borealis*, Alaska, British Columbia, California | 156–164 (161.3) | 50–55 (52.4) |
| 3 females, *costaricensis*, Estado de México, Zacatecas | 150–161 (156.3) | 49–52 (50.7) |
| 2 females, *costaricensis*, Costa Rica | 155–156 (155.5) | 48–50 (49.0) |

**Heliomaster constantii*. Constant Star-throat.—Phillips collected a male September 12 at Moyahua, and heard another a few minutes later. We lack adequate material for racial identification.

**Amazilia verticalis ellioti*. Violet-crowned Hummingbird.—An adult male was collected near Jalpa September 8. Several were seen at Momax July 17 and 18, and one at Moyahua July 26; Phillips saw one September 10 at Moyahua.

*Centurus uropygialis sulfuriventer*. Gila Woodpecker.—Five were seen on July 18 at Momax, several each day, July 25 to 27, at Moyahua, and several each day, September 8 to 13, 4 miles south of Jalpa, a mile north of Apozol, and at Moyahua. A female was taken near Jalpa, September 8.

*Lepidocolaptes leucogaster leucogaster*. White-striped Woodhewer.—We found it a common resident of oak woodland and pine–oak forest; it was noted almost every day in June, July, and September west of Milpillas, at Zorilla's, and near Monte Escobedo. Our six specimens are slightly intermediate toward *umbrosus*.

**Platypsaris aglaiae richmondi*. Rose-throated Becard.—At Moyahua I saw three in

the deciduous woodland September 12. An immature female which was collected is near *richmondi*, although rather gray-backed for that race. Also, it is peculiar in having on the rectrices a sharply-demarcated gray tip 8 mm. long.

**Myiozetetes similis primulus*. Social Flycatcher.—I saw one beside a sugar cane field near Juchipila July 27. Phillips and I saw three a mile north of Apozol, September 13, one of which Phillips collected and later identified.

*Myiarchus nuttingi inquietus*. Nutting's Flycatcher.—At Moyahua I saw two July 26, and collected an adult male September 12; Phillips heard two there on September 13. The specimen was identified by Phillips.

*Empidonax difficilis bateli*. Western Flycatcher.—Four males in full breeding condition were taken, June 28 to July 11, at Laguna Valderama and west of Milpillas. In each case, the habitat was a cool ravine with steep rocky walls. Dr. Phillips identified my specimens, commenting that *bateli* was somewhat doubtfully separable from *hellmayri*.

*Empidonax hammondii*. Hammond's Flycatcher.—Very common in the pine–oak country in September; specimens were taken September 16 near Monte Escobedo, and September 27, 8 miles west of Milpillas. My identification was verified by Phillips.

*Empidonax oberholseri*. Dusky Flycatcher.—Phillips took and identified a specimen September 11 at Moyahua.

*Empidonax wrightii*. Gray Flycatcher.—A female was taken September 9 at Moyahua.

*Empidonax minimus*. Least Flycatcher.—On September 11 at Moyahua two were taken.

**Empidonax fulvifrons rubicundus*. Buff-breasted Flycatcher.—Almost every day spent in the pine–oak country in June, July, and September, and at each locality, one or two were noted. I took a specimen June 23 at Laguna Valderama.

**Tachycineta thalassina*. Violet-green Swallow.—No doubt a common nesting bird in all types of pine–oak habitat where a few were seen each day in June, July, and September; a nest in an oak stub was examined on July 11, 13 miles west of Milpillas, and contained large young; that same day a flying immature was taken there. Large flocks seen near Jalpa, July 27 and September 8, and smaller flocks near Moyahua, September 9 to 13, probably were migrants. A single bird in the valley 4 miles south of Sombrerete June 19, 1952, must have been a vagrant.

*Corvus cryptoleucus*. White-necked Raven.—From one to 20 were seen each day in every locality except the pine–oak areas and those short-grass plains (generally at higher elevations and more humid) which were bordered by oaks (Laguna Valderama and the La Mesa–Santa Teresa grassland.) A specimen was taken in the juniper–piñon at Cerro Gordo, July 2, as previously reported (Webster, 1954*a*).

**Sitta pygmaea chihuahuae*. Pigmy Nuthatch.—I saw flocks of four birds each in pine forest, at Laguna Valderama, July 9, and 13 miles west of Milpillas, July 10; a specimen was taken from each flock. Phillips collected two from a flock of three in pine forest 13 miles west of Milpillas September 26.

**Campylorhynchus gularis*. Spotted Cactus Wren.—There were two family groups near our camp near Monte Escobedo, and one or both were seen each day, September 15 to 20. A young bird in juvenal plumage was collected by Phillips, and an adult by Webster.

**Melanotis coerulescens effuticius*. Blue Mockingbird.—At Moyahua, one or two were noted each day in the deciduous woodland, July 26 and 27 and September 9 to 12. A male was taken July 27.

**Ridgwayia pinicola*. Aztec Thrush.—On July 5, two males and a female were eating madroño berries in predominantly pine–oak woodland atop a ridge at 9,000 feet at Zorilla's. Thirteen miles west of Milpillas I saw a pair July 11 (male taken, in full breeding condition, the testes 12 mm. long, cloacal protuberance well developed and filled

with sperm) and two pairs and an extra male July 12 (female taken, brood patch present, had recently laid a set). At the latter locality, all were in the shady pine-oak woods along cliffs at the rim of a barranca; their actions indicated nesting. Stephen L. Russell saw one July 14, 1950, near the edge of a barranca at Rancho Hornillas. On September 17 Phillips took an adult female of two seen at the edge of the barranca on Monte Escobedo, and I saw a female there the next day.

I noted the vocabulary of the species to include a melodious trill, reminiscent of the song of the Varied Thrush (*Ixoreus naevius*), an attention or alarm note rather similar to the alarm note of the American Robin (*Turdus migratorius*), but a bit squeakier, and a warning or distress call that was written "sun-weep," most reminiscent of the warning call of the Hermit Thrush, but louder and more shrill.

*Catharus guttatus auduboni.* Hermit Thrush.—Phillips collected (and later identified) an immature female near Monte Escobedo, September 19. Later, Phillips saw two in thick brush north of the Cerro Gordo camp on September 29.

**Catharus aurantiirostris.* Orange-billed Nightingale Thrush.—My only records are from the slope west of Monte Escobedo, below the mesa rim, in humid, brushy oak woodland along a cascading creek. Two were seen and two more singing males heard on July 21; the male taken was in full breeding condition, with testes 10 and 6 mm. long and cloacal protuberance well-developed and full of sperm. I saw three September 18. The specimen is no doubt of the race *clarus* in the sense of Moore (1937), who referred two birds from the eastern part of the Sierra Madre in Chihuahua to the race of southwestern Mexico, rather than to *aenopennis* of Sonora and extreme western Chihuahua. However, I note that this specimen is smaller (wing 79) and strikingly grayer, less rufescent, more olivaceous, than a series of supposed *clarus* from Guerrero.

**Sialia sialis fulva.* Eastern Bluebird.—A colony was nesting in old woodpecker holes in the oaks of a sparse oak woodland in an arroyo extending through the grassland, 6 miles east of Santa Teresa July 19, and two males and a female were collected. The female had a well-developed brood patch and had recently laid a set. In addition, sight records were: one at Laguna Valderama June 24, three to four at Laguna Valderama July 12, 13 and 14, 1952; two about 5 miles southwest of Milpillas June 25; two July 13, 13 miles west of Milpillas; one July 22, west of Monte Escobedo. Probably more were overlooked among the much commoner Mexican Bluebirds (*Sialia mexicana*).

*Myadestes townsendi calophonus.* Townsend's Solitaire.—On July 11, two were seen and one heard singing 13 miles west of Milpillas, and an adult male with testes 7 mm. long was taken. On September 26, 8 miles west of Milpillas, Phillips collected a female largely in first winter plumage; the next day I saw three and collected a male just beginning the post-juvenal molt. Our specimens illustrate well the characters of the Mexican race. These records represent a southern extension of the breeding range of the species, which is given by the American Ornithologists' Union Check-list (1957) and the Mexican Check-list (Miller, *et al.*, 1957) as south to Durango.

*Ptilogonys cinereus otofuscus.* Gray Silky Flycatcher.—I saw this species only once at Laguna Valderama—a single bird on June 22—but noted it almost every day in the more humid pine-oak areas at Zorilla's, west of Milpillas, and Monte Escobedo. The largest flock was of 35 birds on September 25, 8 miles west of Milpillas, where they were feeding on mistletoe berries. A male taken on June 27, 9 miles west of Milpillas, had been feeding large young that were able to fly but a short distance.

**Vireo bellii medius.* Bell's Vireo.—One was singing from a cottonwood tree beside the Rio Florido July 18, 1952. In 1954, a singing male was taken at the same place, June 29; the testes were 6 mm. long, the cloacal protuberance large and full of sperm.

Phillips saw one, which sang a little, by the river at Moyahua, September 12.

**Vermivora superciliosa palliata.* Spot-breasted Warbler.—In pine–oak woodland at the rims of ravines and barrancas it was seen: July 14, 1952, one by Ernest P. Edwards at Rancho Hornillas; two, June 26, and one, June 28, 9 miles west of Milpillas; two, July 10, and six, July 12, 13 miles west of Milpillas; two, July 21, near Monte Escobedo. A singing adult male, testes 5 mm. long, wing 63, was taken June 26 and an immature male, wing 62, July 12. I am unable to distinguish my two specimens from a series from Guerrero.

**Vermivora celata orestera.* Orange-crowned Warbler.—I saw two and took a female September 18, in the brushy undergrowth of oak woodland on the west slope of Monte Escobedo. I saw another September 22, in the brush by the creek 9 miles west of Zacatecas City. Phillips saw one September 26 and 27, 8 miles west of Milpillas.

**Vermivora virginiae.* Virginia's Warbler.—At Moyahua, three were seen, September 11 and again the next day; a male was taken, September 11. Phillips saw one September 29 at Cerro Gordo.

**Dendroica auduboni nigrifrons.* Audubon's Warbler.—It occurred almost invariably in small flocks together with Mexican Bluebirds in open stands of oaks—two miles east of the town of Monte Escobedo, September 21, between Laguna Valderama and Milpillas, September 24, every day 8 miles west of Milpillas, September 25 to 28, and in oak–juniper at Cerro Gordo, September 29. My female specimen is equivocal in size (wing 76), but the dark brown color places it definitely with the Mexican race.

**Dendroica nigrescens halsei.* Black-throated Gray Warbler.—One was seen at Moyahua September 11; three to five each day at Monte Escobedo, September 16 to 20; one September 24, in oaks just south of Laguna Valderama; and from one to five each day, September 25 to 28, 8 miles west of Milpillas. My specimen (male, September 17) is an extreme example, in its large size (wing 66) and pale blue-gray color, of the southeastern subspecies.

**Dendroica occidentalis.* Hermit Warbler.—On September 7 we saw and collected a female in the willows along a creek 9 miles west of Zacatecas City. Later, the species was seen near Monte Escobedo, two to 12 individuals each day, September 16 to 20. Phillips saw one September 25 and two September 26, 8 miles west of Milpillas.

**Dendroica graciae graciae.* Grace's Warbler.—One or two were seen each day, September 16 to 19, near Monte Escobedo, and September 25 to 27, 8 miles west of Milpillas. Two specimens were taken.

**Seiurus noveboracensis limnaeus.* Northern Waterthrush.—One was taken September 22, beside the creek 9 miles west of Zacatecas City. Dr. Alden H. Miller confirmed my identification.

**Oporornis tolmiei.* MacGillivray's Warbler.—One or two were noted each of these days: 4 miles south of Jalpa September 8; at Moyahua, September 9 to 13; near Monte Escobedo September 18; 9 miles west of Zacatecas City September 7 and 22; Cerro Gordo September 29. A male taken at Moyahua September 11 was identified by Phillips as *O. t. intermedia*.

**Cardellina rubrifrons.* Red-faced Warbler.—A male in a late stage of the post-juvenal molt was taken June 26, from a group of three, 9 miles west of Milpillas; a single bird was seen there June 28. Later, one was seen 13 miles west of Milpillas July 10 and two near Monte Escobedo September 18. In 1952, Webster noted one at Laguna Valderama July 13 and Ernest P. Edwards, one at Rancho Hornillas July 14.

**Setophaga ruticilla tricolora.* American Redstart.—At Moyahua September 11, two were seen and a female taken. Phillips saw one September 29 at Cerro Gordo.

*Tangavius aeneus assimilis.* Red-eyed Cowbird.—About 20 were seen, and an adult male taken (wing 109) July 18 at Momax. Flocks of 30 were seen July 26 at Moyahua and July 27 at the edge of Juchipila. We previously reported a sight record from the Rio Atotnilco (Webster and Orr, 1954).

*Icterus parisorum.* Scott's Oriole.—Common in cactus–acacia–mesquite grassland and also in juniper–piñon and in drier scrub oak areas near the edge of the grassland. An immature male was taken June 24 at Laguna Valderama.

**Icterus wagleri castaneopectus.* Wagler's Oriole.—At Momax, one was seen July 17 and two July 18; in the Juchipila Valley from 22 miles north of Jalpa to Moyahua, in each site visited, July 25 to 27 and September 7 to 13, from one to eight were seen each day. Beside a creek 6 miles north of Villanueva, there were two in some tall cottonwood trees July 25. Two males taken at Moyahua July 26 and September 11, together with a specimen taken near Colotlan, Jalisco, July 17, belong uniformly to the northern race on the basis of color.

**Icterus pustulatus.* Streak-backed Oriole.—Near Jalpa two were seen September 7 and 13 and six September 8; at Moyahua two to seven were seen each day, July 26 and September 9 to 13. Comparative material is inadequate for subspecific identification of our four specimens.

**Icterus cucullatus cucullatus.* Hooded Oriole.—I saw a male with much bright orange-red on his head 4 miles north of Jalpa September 13, and Phillips took an immature male there later. We examined a specimen in a taxidermist's shop in Juchipila which was in the plumage of an adult male of this race; it was said to have been taken near the town; the wing was not measurable.

*Pyrrhuloxia sinuata sinuata.* Pyrrhuloxia.—Subsequent to the original description in 1837 by Bonaparte, the type locality of the species was restricted to "Zacatecas" by Bonaparte himself (1850), but the type specimen is labeled only "W. Mexico," and the original description called it "Western parts of Mexico." The collector and source, then, remain unknown (Van Rossem, 1934), although it *may* have been collected near Zacatecas City by Wollweber. According to Van Rossem, quoted in Amadon and Phillips (1947), the type, a male, measures: wing 94, tail 101.

No other specimens have been reported from the general area designated as the type locality, and so mine are placed on record. A male from 7 miles north of Colotlan, Jalisco, July 17, measures: wing 96, tail 103; a female from 14 miles south of Garcia, Zacatecas, September 14, measures: wing 91, tail 102; in color they show no approach to the Pacific Coast race. These localities are, respectively, 37 and 46 miles southwest of Zacatecas City; I doubt that the species occurs regularly much closer than this. All our sight records are from the Jerez Valley, from 14 miles south of Garcia southward to near Colotlan, and from the Juchipila Valley, from 38 miles south of Villanueva southward to 4 miles south of Jalpa.

**Loxia curvirostra stricklandi.* Red Crossbill.—At Laguna Valderama, Ernest P. Edwards heard a flock July 16, 1952; I saw one June 24 and a flock of 12, July 8. West of Milpillas, two were noted June 26, and 10 on September 25. Near Monte Escobedo, a few were noted each day, July 20 and 21 and September 16 to 19. Two males and a female were taken July 8, at Laguna Valderama.

**Volatinia jacarini.* Blue-black Grassquit.—Seen almost exclusively in sugar cane fields—15, July 18 at Momax, and two to eight a day July 25 to 27 and September 8 to 12 in the Juchipila Valley from 4 miles north of Apozol to Moyahua. My specimen is racially unidentifiable, because it is an adult male taken July 18.

**Aimophila rufescens rufescens.* Rusty Sparrow.—On the precipitous slope west of

Monte Escobedo, in an area where tall bunch grass flourished beneath oaks 10 to 20 feet high, I collected one July 21 and saw two, one of them in juvenal plumage, September 18. The male specimen was in full breeding condition—testes 8 mm. long, cloacal protuberance large and full of sperm.

**Aimophila quinquestriata quinquestriata.* Five-striped Sparrow.—From two to five were seen each day at Moyahua, where they lived in the brush on the cliffside, July 26 and 27 and September 9 to 13. The birds were paired and singing in both July and September. Phillips and I each collected a male September 10. Both were in breeding condition, with the testes 6 and 14 mm. long, respectively, and the cloacal protuberances large and full of sperm.

*Spizella wortheni browni.* Worthen's Sparrow.—No colonies were located except for the one previously reported at Cerro Gordo (Webster and Orr, 1954; Webster, 1955). There a census indicated 10 breeding pairs in the summer of 1954. In 1955, two individuals were seen there September 6 and three September 7. The addition of three more specimens, taken in June and July, 1954, serves to confirm the color differences on which the description of this race was based.

## Literature Cited


Amadon, D. and A. R. Phillips
1947 Notes on Mexican birds. *Auk*, 64:576–581.

American Ornithologists' Union Committee
1957 Check-list of North American birds. 5th ed. (Amer. Ornith. Union, Baltimore): 1–691.

Anonymous
1939 Atlas climatologica de México. (Sec. Agric. y Fomento, Mexico, D. F.)

Bonaparte, C. L.
1850 Conspectus generum avium. Vol. I.

Davidson, M. E. M.
1934 An occurrence of the northern black swift off the Guatemalan coast. *Condor*, 36:37.

Gentry, H. S.
1946 MS The Durango grasslands. (Ph.D. Thesis, Univ. of Michigan, Ann Arbor.)

Goldman, E. A.
1951 Biological investigations in Mexico. *Smithsonian Misc. Coll.*, 115:1–476.

Leopold, A. S.
1950 Vegetation zones of Mexico. *Ecology*, 31:507–518.

Miller, A. H., H. Friedmann, L. Griscom, and R. T. Moore
1957 Distributional check-list of the birds of Mexico. Part II. *Pac. Coast Avif.* no. 33:1–436.

Moore, R. T.
1937 Four new birds from northwestern Mexico. *Proc. Biol. Soc. Wash.*, 50:95–102.
1941 Three new races in the genus *Otus* from central Mexico. *Proc. Biol. Soc. Wash.*, 54:151–160.

Shreve, F.
1942 Grassland and related vegetation in northern Mexico. *Madroño*, 6:190–198.

Van Rossem, A.
1934 Notes on some types of North American birds. *Trans. San Diego Soc. Nat. Hist.*, 7:347–362.

WEBSTER, J. D.

1954*a* Breeding-bird census: mesquite grassland with scattered junipers. *Audubon Field Notes*, 8:376–377.

1954*b* Breeding-bird census: mixed woodland (Pine–oak forest–mesquite grassland ecotone). *Audubon Field Notes*, 8:377–378.

1956 Birds and grasslands in western Mexico. *Hanover Forum*, 3:34–45.

WEBSTER, J. D., AND R. T. ORR

1952 Notes on Mexican birds from the states of Durango and Zacatecas. *Condor*, 54:309–313.

1954 Summering birds of Zacatecas, Mexico, with a description of a new race of Worthen sparrow. *Condor*, 56:155–160.

HANOVER COLLEGE, HANOVER, INDIANA, AND CALIFORNIA ACADEMY OF SCIENCES, SAN FRANCISCO, CALIFORNIA, NOVEMBER 25, 1956

# LIFE HISTORY OF THE BANANAQUIT OF TOBAGO ISLAND

BY ALFRED O. GROSS

In a six-week period, January 8 to February 21, 1957, I had an excellent opportunity to observe the nesting and behavior of Bananaquits (*Coereba flaveola luteola*), locally known as "Sugar Birds", on Tobago, British West Indies. Tobago is a relatively small island, 27 miles long and 7½ miles wide, with an area of 114 square miles; it lies 18 miles northeast of the larger island of Trinidad. Tobago has a population of about 3300 human inhabitants, and much of its coastal area is characterized by extensive coconut and cocoa plantations. The higher mountainous portion includes a main ridge which runs almost the entire length of the island, and is covered with a lush tropical rain forest. During January and February the scarlet-colored blossoms of the many giant mountain immortelle (*Erythrina micropteryx*) trees add beauty to vistas in the enchanting mountain fastness.

Tobago and Trinidad are near the northern coast of South America; in fact a promontory of Trinidad is only four miles from the mainland of Venezuela. As one might expect, the avifauna of these islands, especially Trinidad, resembles more closely that of northern South America than that of the Antillean region. For example, such conspicuous species as the Amazon Parrot (*Amazona amazonica*), Swainson Motmot (*Momotus bahamensis*), Red-bellied Trogon (*Trogon collaris*), Rufous-tailed Jacamar (*Galbula ruficauda*), and many others are to be found on these islands, but are absent or rare in the West Indian islands to the northward. Between January 16 and February 20, 1957, Mr. and Mrs. Whitney Eastman identified 97 species of birds on Tobago, which is indicative of the richness of the bird life on this small island.

Without exception the Bananaquit is the most abundant species to be found on Tobago. This bird was given special attention because of its abundance and the fact that many were nesting during the time I spent on the island. Skutch (1954) has published his observations on two subspecies, *mexicana* in Costa Rica and *colombiana* in the Panama Canal Zone, and Biaggi (1955) has written a full life history account of *C. f. portoricensis*, the Puerto Rican form. However, it appears justifiable to present certain observations on the subspecies *luteola*, the most southerly of the West Indian forms which lives on an island remote from areas mentioned above. These will serve to corroborate as well as to augment other information concerning this interesting species, which is represented by no fewer than 35 subspecies (Hellmayr, 1935: 284–314). The range of *Coereba flaveola* includes nearly all the Greater and Lesser Antilles and continental regions from southern Mexico south to northern Argentina.

This prolific, adaptable bird appears to be nonmigratory. In the West Indies, the various populations remain on their respective islands, although in certain instances the islands are only relatively short distances apart. As a result many subspecies have developed in which there are marked differences in plumage coloration, and at least minor differences in behavior associated with their adaptation to local environmental conditions.

The subspecies *luteola* occurs also on Trinidad and in northern Venezuela south to the Orinoco Valley and the foot of the Andes in the Maracaibo basin, and west along the Caribbean coast of Colombia. It is accidental on Grenada (only one record) where the prevailing form is *Coereba flaveola aterrima*.

On Tobago *C. f. luteola* has the upper parts including loreal, suborbital, and auricular regions and sides of the neck sooty black. There is a large lemon-yellow rump patch, a prominent superciliary stripe which extends from the nostril to the nape, and a very conspicuous white spot on the outermost primaries. The malar region, chin, and throat are slate gray, a color which varies greatly among the different subspecies. The rest of the underparts are saffron yellow or yellow-chrome shading to olive on the flanks. The under tail coverts are white and the inner webs of the outer tail feathers are tipped with white. On Tobago I saw no melanistic phases of the plumage such as those present in the subspecies occupying Los Testigos islands and those predominating in populations on Grenada and St. Vincent (Bond, 1936; Devas, 1954), where the normal, yellow-bellied plumage is not common. There were no Tobago specimens examined or birds observed in the field which had the bright crimson rictus often found in other subspecies.

In the different subspecies of the Bananaquit as viewed in the field, the sexes look alike in plumage coloration and markings. However, close examination of skins reveals that the male may be slightly larger and have a more extensive, brighter color on the rump.

## General Comments on Nesting

I have never encountered more active nest-builders than the Bananaquits on Tobago Island. Within a radius of half a mile of the Bacolet Guest House, located near the sea on the southern side of the island, I found 54 nests during the six-week period. Some were in early stages of construction; others were more advanced or completed. Some contained eggs or young; others were the so-called "roosting" nests. These birds have been reported as nesting on Tobago in every month of the year, with the peak in April and May. It seems remarkable that so many were nesting in January and February. Doubtless many of the nests in that limited area were missed and a thorough search would have revealed more. Through a distance of a quarter mile along the main road between the Bacolet Guest House and Blue Haven Hotel there were

14 nests, eight in a hedge of Euphorbia on one side and six in low vegetation growing on the clay embankment of the opposite side. The nests in the Euphorbia hedge ranged from four feet to eight feet above the ground. Those on the embankment were situated only two or three feet above the surface of the road and only a foot or two from the soil of the bank. The other 40 nests were in a diversity of vegetational situations varying from weed stalks and small shrubs to locations well up in coconut palms and other tall trees. The highest ones in the Bacolet area ranged from 30 to 35 feet above the ground.

One nest was built in a cornice of the overhanging eaves of the Blue Haven Hotel; two were placed in vines which were trained above the large open window-spaces of the main dining room and another was in the Spanish glass chandelier of the hallway. The last mentioned nests were in places where guests of the hotel passed frequently at all times of the day. In spite of the mess produced by the dropping of nesting materials and debris on the rugs and carpets, the hotel management encouraged the birds which provided a center of attraction for the guests. During Christmas week a pair of Bananaquits built a nest in the large Christmas tree located in the main open reception hall of the hotel. A most bizarre if not fantastic structure, this nest was composed chiefly of glistening bits of tinsel and small ornaments which the birds took from the decorations of the tree.

Nest number 44 was another unusual one; it was constructed in a Bougainvillea vine growing by the doorway of the hotel and adjacent to a taxi stand where automobiles passed frequently at a distance of two or three feet. It was only four feet above the ground and was constructed of varied, colored strings, threads, bits of cloth and cotton interwoven with plant fibers and vine stems. Red, green and orange strings predominated, making it a most colorful structure. At first the vine holding the nest was bent away from the doorway so that automobiles sometimes brushed against it. The vine was finally tied firmly to the building in such a way that the nest opening was toward and only eight inches from the frame of the doorway. In spite of this change and the continual disturbance to which this pair of birds was subjected, they succeeded in rearing three young. Other individuals were found to use string, cloth, and cotton (especially wild cotton) wherever these materials were readily accessible. On Barbados Island I found a nest near the Ocean View Hotel, Hastings, which consisted chiefly of twine and colored yarn.

There seemed to be no effort on the part of the birds to build nests in concealed locations. In fact almost every nest was in an open exposed place, usually at the terminus of a branch where it was easily seen from a distance. Thus it required no time-consuming effort to locate the many nests found.

On Tobago the Bananaquits and their nests were found at all altitudes. Nest number 24 was built near the tip of a long branch overhanging the water

at the Bacolet bathing beach. At high tide this nest was less than five feet above the surface of the water, and at times fine spray from the breakers would strike it. While there was a greater concentration of nesting birds in the lowlands where there are human habitations and cultivated land, nests were found also in isolated forested areas as high as the top of Pigeon Peak, an elevation of 1890 feet, the highest point on the island. On Trinidad Island I found a nest with three eggs in a solanaceous weed near a trail off the Blanchisseuse road, at an elevation of 2500 feet. On numerous trips to the wooded, mountainous portions of Tobago a great many nests were seen but at no place was the concentration of the birds as great as that at Bacolet in the coastal area. Nests at higher elevations generally were located in trees and were usually a considerable distance above the ground. I saw a dozen nests which ranged from 20 to 35 feet above the ground, in bamboo trees growing at elevations above 1000 feet. There were two occupied nests located among blossoms near the tops of Immortelle trees; their estimated heights were 60 and 65 feet, respectively. One of these was within 15 inches of an active wasp nest. These two nests represented the maximum height above the ground among those observed on Tobago. There is no nesting site that can be said to be typical. Not only do the birds nest at heights above the ground varying from one foot to 65 feet, but they may use any kind of weed, vine, shrub or tree that is capable of holding a nest. In addition to sites already mentioned, nests were found in Oleander and Hibiscus hedges and trees including orange and grapefruit, bread fruit, moringo, banyan, gumbo-limbo, guava, sapodilla, tamarind, poui and "bread and cheese tree" as well as in other trees, shrubs, and weeds that I did not identify.

Some of the occupied nests were very close to each other, and there was not the strong territorialism in the Tobago Bananaquits that is so well developed in many other species. Near Bacolet different pairs occupied two brood nests which were only 10 feet apart in a Euphorbia hedge. Although watched for long periods of time, these pairs displayed no hostility or defensive action. At the Blue Haven Hotel there was a nest of a Bananaquit built in the pendant fruiting stem or "broom" of a bamboo palm which was only 12 feet from a nest of a pair of Mockingbirds (*Mimus gilvus*). These two pairs of birds reared their broods successfully and at no time did I see any hostile action on the part of the Bananaquits. In practically all instances observed, the Bananaquits were passive, noncombative creatures and only seldom did they protest the presence of birds, other animals, or human beings that appeared in the vicinity of their nests. I once saw a Bananaquit, evidently a "stranger" take a bit of nesting material from a nest in which another was incubating eggs. The incubating bird remained on the nest offering no resistance to the intrusion. Almost every bird that I flushed flew directly away from its nest; as a

rule neither the male nor the female made any demonstration. However, I have noted spirited contests between Bananaquits, due, oftentimes, to a triangle involving two males and a female. Such contests did not necessarily relate to defense of a nest or territory. Biaggi (1955) found territorialism strongly exhibited in *portoricensis*, especially toward individuals of the same species.

## Nest Building

The construction of three nests, which were observed from the very beginning, was carried out in an essentially similar way.

On January 23, at 10:00 a.m., I saw a Bananaquit flying with a long palm fiber, which was measured later and found to be 23 inches in length. The bird grasped the fiber near the center with the ends streaming back on either side as it flew to the tip of a long branch of a bread-and-cheese tree (*Pithecolobium unguis-cati*), which extended over the water at Bacolet Beach. The site selected was 68 inches above the sand. This first fiber was draped over the leaves and stems without any attempt to secure it in place. For the next hour a substantial mass of rather long plant fibers and vine stems were added to form a crude platform. No effort was made to arrange and secure the first 25 bits of nesting material, but thereafter the bird spent considerable time at frequent intervals in order to arrange and secure the fibers. It would grasp one of the fibers of the platform and reach upward with its body and head extended to secure the fiber as high as it could reach. This was repeated again and again as more nesting material was brought. On several occasions extremely long fibers which hung well below the level of the platform were grasped by the bird in flight and brought up and bent or twisted around a supporting stem. On one occasion I saw a bird make two complete revolutions in flight with the free end of a fiber in its beak as it wound it around the branch, much after the manner of nest building of the Black-tailed Flycatcher (*Myiobius atricaudus*) which I observed in Panamá. The Bananaquits worked industriously until 3:00 p.m. but after that time only four visits were made and all activity ceased at 4:30 p.m. When I arrived at the nest at 6:00 a.m. the next day only a small amount of material had been added, but the birds made 34 visits with nesting material between 7:00 and 7:31. On most of these trips a bird would remain only a few seconds, just long enough to deposit the fibers inside the flimsy framework of the structure. After 7:31 one bird spent considerable time within the nest, arranging the materials previously placed there in a haphazard manner. It repeatedly pulled and tugged the fibers and wove the sides and top of the nest. It frequently thrust its body against the walls to make them more compact. During one visit one of the birds worked with a fiber more than 20 inches long which was hanging from the entrance of the nest. It flew out and grasped the tip of the fiber while on the wing and pulled it part way inside. This was repeated three times before the fiber was neatly woven into the interior framework. Both male and female brought nesting material, and whenever they arrived at the same time one waited patiently at some distance until the mate had deposited its material and departed. One bird, which was probably the male, sang its characteristic song several times between trips to the nest. On January 25 the birds were taking fine coconut-husk fibers through the opening tunnel, which was now lined and formed. The interior of the nest was still large, approximately 2 × 2½ inches in size. The birds were now bringing nesting materials about every 5 to 10 minutes, and more time was taken in arranging them. While in the nest, a bird could no longer be seen

from my observation post, but its movements could be detected when it exerted pressure against the sides or top of the interior. At times the birds were seen to alight on top of the nest and weave long fibers or pieces of vine into place. Fibers which were hanging down from the outside were pulled up and tucked into the structure. But at this stage most of the nesting material was being added to the inside in thickening the walls. By 4:00 p.m., January 26, the nest (number 24-A) appeared to be completed, having required a little more than three days to build. The interior cavity or nesting bowl was only 1½ × 1¾ inches in size and was neatly and compactly lined with brown coconut-husk fibers. The entrance, which was at the lower part of one side of the nest, was 1⅛ inches in diameter. Extending from the entrance to the edge of the interior cavity was a tunnel some two inches in length. At the bottom of the inner end of the tunnel there was a thickened, very compact ridge; this was later to serve in preventing eggs or young from rolling out when the nest was buffeted by strong winds. The exterior of the nest measured 5½ inches in length and 4¼ inches from top to bottom.

Neither bird was seen on January 27 but several times I saw an Emerald Hummingbird (*Saucerottia tobaci*) buzzing about, curiously inspecting the nest. Several larger birds and many lizards were seen in the vicinity but none bothered the nest. On January 28 one of the Bananaquits was roosting in the nest at night. On January 29 there was one egg at noon; in the evening there was still one egg and no bird roosting at night. On January 30 there were two eggs at 10:00 a.m., but no bird was seen. On January 31, at 7:00 a.m. a bird was incubating, presumably the female which I flushed in order to examine the contents of the nest. The bird returned in four minutes and dashed directly into the nest opening without even alighting or hesitating. The eggs were incubated until February 5 when, unfortunately, they were taken by some predator. There was a small rounded hole in the rear part of the nest, presumably the work of a Lesser Antillean Grackle (*Holoquiscalus lugubris*), since several of these birds had been seen near the nest on the preceding day. One of the Bananaquits roosted in the nest at night even though the eggs had been taken. On February 8 the Bananaquits were seen carrying materials from this nest, piece by piece, to a new location, which was in a tree about 20 feet above the ground, some 50 feet away. Two days later all but a few fibers (including one 58 inches in length) had been removed from the old nest and incorporated in the new one (No. 24-B). The next day the remaining fibers had also been removed. The second nesting attempt was successful.

On January 8 the beginning of a nest (No. 3) was found near the Blue Haven Hotel. At that time there was only a crude platform of about 25 weed, grass, and vine stems located in a scantily leaved rose bush about three feet above the ground. Later this nest was used for roosting but not for eggs or a brood. Only one bird was seen working on this structure, which was built in the same way as previously described for nest number 24-A. At the time the nest was being built, Mockingbirds, Blue Tanagers (*Thraupis episcopus*), Ground Doves (*Columbigallina minuta*), Lesser Antillean Grackles, and many

lizards were seen near the nesting site but none of them interfered and the Bananaquit offered no objection. The nest was practically completed on the third day but had many small holes through which light could be seen by one looking through the entrance. Later a bird was seen carrying bits of cotton into the nest; these were thrust into the thin places in the sides and roof. More than 30 pieces of cotton were used which served to make the nest (with the exception of the entrance) well-nigh light proof. I visited the nest each day for a week but it remained empty and no birds were seen. On the eighth day after it had been completed, I visited the nest with a flashlight at 9:00 p.m.

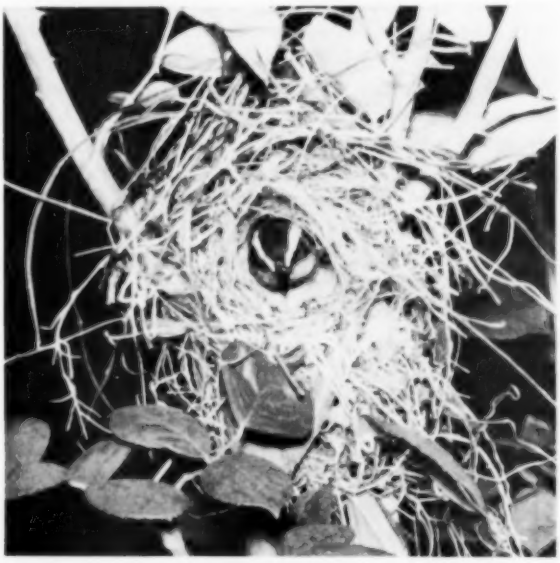

FIG. 1. Flashlight photograph of bird roosting in nest No. 3.

and discovered that a Bananaquit was roosting there and no doubt had been doing so since the nest had been completed (Fig. 1). This nest was visited almost every night until the time I left the island on February 21, and invariably the bird was roosting in it. I never saw the bird on the nest during the midday hours, but it came to the nest in the evening about six o'clock while it was still light, before the sun had set. It would remain on the nest until sunrise. In early evening the bird always roosted with its head toward the entrance, but after dark its head was bent back and tucked into the feathers of the scapular region. The flashlight and the flash bulbs of the camera normally did not disturb it, although my playing the flashlight back and forth on the

sleeping bird would cause it to awaken, remove its head from the feathers, and peer toward the opening—an ideal pose for a flashlight photograph (Fig. 1). Similar observations of sleeping Bananaquits have been reported by Skutch (1954:412).

Nest number 15, located near the tip of a long lower branch of a banyan tree near the Bacolet Guest House, was discovered when it was in the process of being constructed. It also proved to be a roosting nest but here both male and female took an active part in building. In addition to the usual plant stems and fibers, the birds used a large number of strips of paper-thin bark gathered from dead limbs of the banyan tree. On January 19 I watched this pair of birds for about two hours, in which time both birds were seen tugging at bits of bark from a dead limb, only about 15 feet from the nest. After each strip was freed, it was carried to the interior of the nest, which at that time was well formed and nearly completed. On three occasions I saw both birds, one at either end of a prized strip, rapidly fluttering their wings and vigorously pulling and tugging in an effort to loosen it. This performance took place within three feet of a Yellow-bellied Elaenia (*Elaenia flavogaster*) perched on the same limb. With its crest well elevated the Elaenia seemed much interested as it peered at the Bananaquits but it was not disturbed and did not move an inch during this exciting event. Although nest number 15 was constructed by both the male and female it was used as a roosting nest by only one of them, probably the male.

Certain nests are built and never used. For example, two nests, one built five feet above the ground in a Euphorbia hedge and another constructed 3½ feet above the ground in a small shrub, were discovered when they were nearly completed. They were excellently built nests, better than the usual structures, and were in good locations. Still, they were never used either as roosting or brood nests. They were visited almost every day (including visits at night) for a period of four weeks. Even if the builders had been killed it seems strange that these nests were not used by other Bananaquits, which frequently use abandoned nests at least as roosting places.

These active, restless birds seem to have an irresistible impulse to build nests, and there seemed to be constant building activity among the birds observed on Tobago Island. One nest was being built in a tall mango tree at a point 12 feet above the ground when first observed on January 25. The two birds worked diligently on January 26 and the nest was completed by the afternoon of the next day. The pair was not seen during the next two days, but on January 30 I saw one, then both, birds taking nesting material from the nest and carrying it to a new site 15 feet up in a sapodilla tree near the main Bacolet building. The pair of birds worked diligently until all of the materials of the first nest, number 32-A, were transported to 32-B and then additional

fibers were collected from the thatched roof of the dining room and added to the interior of the nest. These fibers were collected with a great deal of effort, requiring much tugging, pulling and fluttering of wings, greatly to the amusement of the dining-room guests. Nest 32-B was completed in a little less than four days and was a fine example of Bananaquit architecture. However, this second nest was never used, and after three days it was all taken apart and moved to an orange tree for purposes of building nest 32-C, which was finally accepted as a brood nest. I can offer no explanation for this peculiar behavior since as far as I could determine, the birds never were molested and each site seemed as good as the others. In instances such as these the birds seemed to build nests just for the "satisfaction" of building them.

Sometimes birds started building nests but stopped after a substantial beginning had been made. A fruiting-frond "broom" of a coconut palm was left standing beside a door leading to an apartment at Bacolet Guest House. Much to our surprise a Bananaquit started to build a nest in the frond but later deserted the site after about 50 fibers had been placed. A nest under the eve of our veranda and another in an attractive site in an oleander bush were started but never completed.

TABLE 1

MEASUREMENTS OF EASILY ACCESSIBLE NESTS OF THE BANANAQUIT IN THE BACOLET AREA OF TOBAGO

| Number of nests | Status when measured | Height above ground in feet (mean and extremes) | Outside dimensions in inches (means and extremes) | | Diameter of entrance, inches (mean and extremes) |
|---|---|---|---|---|---|
| | | | Length, front to rear | Depth, top to bottom | |
| 8 | Empty, or used for roosting only | 5.5 (2.5–15.0) | 5.4 (4.5–6.5) | 4.6 (3.2–5.5) | 1.0 (0.7–1.1) |
| 12 | With eggs or young | 5.0 (2.6–8.0) | 5.5 (4.0–7.0) | 4.1 (2.9–5.0) | 1.0 (0.8–1.5) |

Although the nests are small in dimensions (Table 1) a great deal of nesting material goes into their construction (Fig. 2). Four typical nests were dissected to determine the number of pieces of nesting material that were utilized. In these four nests the number of pieces of material varied from 404 to 650 which is indicative of the great number of trips and the immense amount of labor expended by the birds in the construction of a nest.

### ROOSTING NESTS

Of the 54 nests observed in the vicinity of Bacolet, eight proved to be purely roosting nests, and others were used as roosting or dormitory nests before the eggs were laid or after eggs or young had been destroyed or young birds had fledged. I was not able to determine the sex of the roosting birds,

but Biaggi (1955) has shown that either sex may be involved in *C. f. portoricensis*. As suggested in Table 1, I did not find any consistent differences in size and structure between roosting and brood nests. Except in two instances, as mentioned below, I was not able to identify a brood nest belonging to a roosting individual. Two nests, numbers 8 and 9, were built in vines that had been trained over the large open windows of the Blue Haven dining room. They were 7½ feet above the level of the floor. Nest number 8 was a brood nest in which three young were reared, and number 9, on the same

FIG. 2. Bananaquit nest No. 43, with two eggs in place, sectioned to show size of interior, thickness of walls and position of entrance. Nest held in the hand to lend an impression of size.

level but 15 feet away, was a roosting nest of the mate, probably the male, which spent the night in it throughout the period in which the eggs were incubated and the young reared in nest number 8. Even after the young left the latter nest, number 9 continued to be used as a roosting nest. A week after the young left number 8, the materials of this nest were removed and transported to a site in a Spanish glass chandelier in the adjoining hallway for the

construction of a new nest. This second-brood nest of this pair was completed just after I left the island, but I have been informed that the birds were successful in rearing a second brood.

On January 31, 1957, I discovered a double-decker nest, numbers 42-A and 42-B, which had been built about 15 feet above the ground near the top of an orange tree. The lower nest was anchored to several small branches of a large limb, and the other was built on top of and slightly forward from the lower compartment. The materials of one nest were continuous with those of the other. When first discovered, the upper compartment contained two nestlings

TABLE 2

DETAILS OF COMPOSITION OF FOUR NESTS OF THE BANANAQUIT

Nest No. 12, taken January 19, 1957. Outside measurements $6\frac{1}{2} \times 5\frac{1}{2}$ inches.

| | |
|---|---|
| 180 | weed, grass, and vine stems 6 to 28 inches in length |
| 60 | pieces of thin bark |
| 2 | pieces of string |
| 7 | dried leaves |
| 155 | fine slender fibers (chiefly in lining) |
| 404 | total number of items of nesting materials |

Nest No. 23, taken January 23, 1957 when it contained 3 eggs. Measurements $6 \times 4\frac{1}{2}$ inches.

| | |
|---|---|
| 230 | grass stems, vines, and palm ribs |
| 60 | pieces of bark from coconut palm |
| 20 | leaves |
| 8 | feathers |
| 210 | fine coconut-husk fibers |
| 528 | total number of items |

Nest No. 53 taken February 21, 1957 when it contained 2 eggs. Measurements $7 \times 3\frac{1}{2}$ inches.

| | |
|---|---|
| 96 | weed, grass and vine stems 4 to 18 inches in length |
| 54 | bits of wild cotton |
| 170 | thin flat pieces of bark from bases of young palms |
| 148 | fine threadlike fibers |
| 6 | feathers |
| 474 | total number of items |

A brood nest taken February 20, 1957, from wooded section of the island not included in the Bacolet series of numbered nests. Measurements $6\frac{1}{2} \times 5\frac{1}{4}$ inches.

| | |
|---|---|
| 125 | long vine tendrils: the longest 41 inches, many exceeding 20 inches, and all more than 10 inches in length |
| 251 | pieces of paper-thin bark, the majority $\frac{1}{2}$ inch in width and 1 to 4 inches in length |
| 274 | fine threadlike fibers chiefly from coconut husks (used in lining) |
| 650 | total number of items |

and the lower was found to be the roosting nest of the mate, or presumed male. After the young left the upper nest, 42-A, the lower nest was occupied for a week, whereupon both nests were deserted. The birds were never seen again about the empty nests.

Nest number 1 was found and observed in December, 1956, by Mr. A. Saltford, and he informed me that two fully fledged young left it on December 28. This nest was located in a small orange tree at a point 5 feet, 4 inches above the ground. When I arrived on January 8, one of the adults was using it as a roosting place and continued to use it as such until January 21 when I found an egg in the nest; there were two eggs on January 22 and a third was laid on January 24. The first egg hatched at 8:00 a.m. on February 4 and the

TABLE 3

MEASUREMENTS OF FIVE EGG SETS OF THE BANANAQUIT

| Nest Number | Date | Egg Number | Length | Width |
|---|---|---|---|---|
| 23 | January 23, 1957 | 1 | 17.0 mm. | 13.1 mm. |
| | | 2 | 17.5 | 13.5 |
| | | 3 | 18.2 | 14.0 |
| 43 | February 3, 1957 | 1 | 19.0 | 13.1 |
| | | 2 | 18.1 | 12.4 |
| 41 | February 12, 1957 | 1 | 17.9 | 13.1 |
| | | 2 | 18.0 | 13.4 |
| 45 | February 12, 1957 | 1 | 17.2 | 12.8 |
| | | 2 | 18.5 | 12.9 |
| Nest found on Trinidad Island | | 1 | 17.8 | 13.5 |
| February 22, 1957 | | 2 | 18.0 | 12.7 |
| | | 3 | 17.9 | 13.3 |
| | Averages | | 17.92 | 13.15 |

second by noon the same day. On February 5 the nest was empty, and a round hole through the wall indicated a predator, probably a larger bird of some kind. In spite of the young being taken, the nest was used by one of the birds as a roosting place for 10 days, after which it was found dislodged and on the ground. From these various observations it is obvious that a roosting nest may later be used as a brood nest or a brood nest may be used for roosting after the young leave or when the eggs or young are taken.

## EGGS

Of 20 nests containing complete sets of eggs, 12 had 2 eggs each, 7 had 3 eggs, and 1 contained only a single egg which was destroyed after 4 days. The

one egg may not have comprised a complete set. Six nests contained two young and two contained three young when first found.

In shape the eggs vary from short oval to short subelliptical. The ground color is pale olive-buff. The markings are dots and spots of Cinnamon Drab and Light Brownish Drab. A set of eggs collected on Trinidad had much paler markings approaching Light Drab. The eggs are all more heavily marked at their larger ends where the ground color is more or less obscured. In some the markings are heavier forming a broad band near the larger end. One of the eggs from nest number 23 had four heavy line markings of Fuscous Black on the larger end. [The colors were determined by comparing with Ridgway's (1912) color standards.] The eggs of five nests were taken for description and for measurements (Table 3).

TABLE 4

DETAILS OF INCUBATION AT FOUR NESTS OF THE BANANAQUIT

| | | | |
|---|---|---|---|
| Nest No. 26 | January 28 | no eggs | |
| | January 29 | 1 egg | (Incubation started January 30) |
| | January 30 | 2 eggs | |
| | February 11 | 2 nestlings | Incubation period, 12 days |
| Nest No. 27 | January 22 | no eggs | (Incubation started on January 23 after |
| | January 23 | 1 egg | first egg was laid) |
| | January 24 | 2 eggs | |
| | February 4 | 1 nestling | 5:00 p.m. Incubation period, 12 days |
| | February 5 | 2 nestlings | 4:00 p.m. |
| Nest No. 28 | January 23 | no eggs | (Incubation started January 25 after second |
| | January 24 | 1 egg | egg was laid) |
| | January 25 | 2 eggs | |
| | February 6 | 2 nestlings | Incubation period, 12 days |
| Nest No. 44 | February 8 | not visited | |
| | February 9 | 1 egg | (Start of incubation not observed) |
| | February 10 | 2 eggs | |
| | February 11 | 3 eggs | |
| | February 21 | 1 nestling | 8:00 a.m. and 6:00 p.m. |
| | February 22 | 2 nestlings | 8:00 a.m. |
| | February 23 | 3 nestlings | 8:00 a.m. Incubation period, 12 days |

In the above series of 12 eggs the length ranged from 17.0 to 19.0 mm.; the width, from 12.4 to 14.0 mm. Belcher and Smooker (1937) give the average measurements of 10 eggs taken on Tobago and Trinidad as 17.2 × 12.8 mm, and the average of 22 eggs from Puerto Rico was 17.5 × 12.6 mm. (Biaggi, 1955).

The incubation period has been determined by Skutch (1954) and Biaggi (1955) as 12 or 13 days. In four instances in which the time of laying, the start of incubation, and the hatching of all the eggs was observed in *C. f. luteola* on Tobago Island, the period was found to be approximately 12 days (Table 4).

The incubation period may be defined as the interval between the laying of the last egg and the hatching of the last egg. There was some evidence (based on the hatching of two eggs in a set of three) that the incubation period was about 12 days in another nest (number 1). (The hatching time of the eggs of nest 44 was noted by Mr. A. Saltford after I had left Tobago.)

## Development of Young Birds

Daily measurements and descriptions were made of the young of several nests, but only a few stages of one young bird are here presented. The following brief account is of a bird hatched at 4:00 p.m. on January 28, 1957. The second young of the same nest hatched an hour and a half later.

The nestling at the time of hatching is entirely naked without a vestige of natal down. The entire body, including the legs and wings is of a deep flesh color. The eyes are closed but the black pigment of the iris shows through the skin. The gape is a pale yellowish white. No papillae of any of the feather tracts are visible. The measurements are: total length, 32 mm.; extent or wingspread 25; manus of the wing, 10.

January 31 (third day). Papillae of the remiges show faintly through the integument. Total length, 42 mm.; extent, 38; wing, 14.

February 2 (fifth day). There is a slitlike opening between the eyelids. The dorsal and ventral feather tracts are now evident, but the papillae are not yet protruding.

February 3 (sixth day). Developing remiges projecting through the integument for an average length of 5 mm. Total length, 56 mm.; extent, 70; wing, 15; bill, 8. Edges of maxilla pale with dark band along the culmen; mandible white-tipped with yellow; gape white.

February 6 (ninth day). Developing primaries and secondaries 10–12 mm. in length, most of the tips unsheathed for about 1 mm.; sheaths of ventral tract a distinct yellow, not unsheathed. Papillae of capital tract do not project through the integument, but all tracts are now clearly defined.

February 7 (tenth day). Ventral tracts with free feathers from 2 to 3 mm. in length. Lateral parts of ventral tract olive-yellow, median parts bright yellow. Tarsi and toes vinaceous slate in color.

February 9 (twelfth day). Total length of "first" or outermost primary 19 mm., its unsheathed tip, 9 mm.; "fifth" primary 22 mm., its unsheathed part, 16 mm.; tail feathers or rectrices 8 mm., unsheathed at tips for about 1 mm. The wing coverts are now unsheathed to the extent that the bases of the remiges are hidden from view. Maxilla now much darker and mandible with a dusky mid-portion. Total length, 76 mm.; extent, 134; wing, 34; bill, 9. The unsheathing of the feathers is progressing rapidly. The eyes are open. The nestling is active and exhibits fear, offering much resistance to handling.

February 11 (fourteenth day). At the age of two weeks the feathers have become unsheathed to the extent that all apteria are covered, but the pinfeathers on the front of the crown and forehead, auriculars, chin, and throat are not yet unsheathed. The white pinfeathers of the superciliary line are not unsheathed. The outermost primary is 24 mm. long, its unsheathed part, 13; "fifth" primary, 33 mm., its unsheathed part, 24. Tarsi and toes leaden in color, nails black, maxilla black, mandible dark slate, the edges horn color;

gape yellow. Total length, 84 mm.; extent, 142; tail, 12; bill, 9. The bird is now very active and tries repeatedly to escape when being measured, but it is not yet able to fly any great distance. Great difficulty was experienced in keeping the bird in the nest after replacing it.

February 13 (sixteenth day). The young bird left the nest when 16 days old (Fig. 3). It was able to fly considerable distances; from a point near the ground it flew to a perch 12 feet above the ground. It was with great difficulty that it was finally caught for measurements and description. Total length, 93 mm.; extent, 168; wing, 39; tail, 22. (For comparison the measurements of a living adult are: total length, 108 mm.; extent, 179; wing, 56; tail, 32.) The crown, back, and tail of a 16-day-old fledgling are blackish slate.

FIG. 3. Bananaquit 16 days of age photographed after flying from the nest.

The edges of the outer tail feathers are white. The feathers of the rump are tipped with olive-yellow. The edge and forepart of the wing are pale yellow; the chin and throat, gray; the breast and belly, bright lemon-yellow; the tarsi and toes, leaden vinaceous; the nails, black. The white superciliary line which is so conspicuous in the adult is less evident since these feathers are not yet unsheathed.

The young bird did not return to the nest after leaving on the 16th day, but the nest was used for roosting by an adult, presumably by one of the parents.

## SONG

There is nothing outstanding in the song of the Bananaquit, and it does not rank high when compared with songs of other passerines. It is high-pitched,

shrill, unmelodious, and unmusical. As Skutch (1954) reports for Central American Bananaquits, "Song appears to be confined to the males;" for the Tobago race I have no evidence to the contrary. Mrs. Whitney Eastman, who has a keen and well-trained ear, interpreted one of the common renditions of *luteola* as *tse-tse-tse sweet; tse-tse sweet; tse-tse-tse.* This average song varies greatly with individuals and conditions. In some birds the song is very much abbreviated and again there may be as many as 12 syllables. The songs I have heard of other subspecies in Panamá and on Barbados and other West Indian islands tend to differ as much as does plumage coloration or aspects of life history. A single high-pitched note is uttered by the female when attempting to locate her young, and the young respond with a similar but more subdued note.

## Enemies

On Tobago and Trinidad as well as some of the other islands of the West Indies the natives trap a great many birds which are kept as caged pets. The Bananaquit is a favorite since it readily adapts itself to and seems to thrive in captivity. Although it cannot be classed as a bird excelling in vocal accomplishments, it is a persistent singer. The birds are secured by placing a caged singing bird, evidently a male, in the vicinity of a nesting pair. An improvised perch fastened to the cage is covered with a viscous fluid, "laglee," obtained from the bread fruit. Being attracted by the singing caged bird, (apparently territorial behavior) the victim alights on the perch and in its attempt to free itself the feathers become entangled in the "laglee." The bird is held fast until freed by the trapper. I was informed that a singing Bananaquit or Blue-black Grassquit (*Volatinia jacarina*) readily sells for a price of 15 to 20 dollars, so that it is a very lucrative business for the native trapper. It is only when the birds are nesting that trapping proves successful, with the result that not only are the adult birds removed but also the nestlings are destined to suffer—at least in many instances.

While I was on Tobago and Trinidad during January and February, 1957, the Field Naturalists' Club of Trinidad was making a determined effort to have legislation passed to prohibit the trapping and caging of native birds. Many articles and editorials appeared in the local newspaper, *The Trinidad Guardian*, both for and against the practice. It is doubtful that prohibitive legislation can be secured immediately because of the long-standing nature of this practice. Such progress as is made will be slow and will be achieved through educational methods, just as bird protection has been accomplished in America through conservation education, in which the National Audubon Society has played a major part.

Since there are very few predatory hawks and owls on Tobago, they have little effect on the numbers of Bananaquits. It was only rarely that we saw a Broad-winged Hawk (*Buteo platypterus*) or a Pigeon Hawk (*Falco columbarius*), the only species of hawks observed in the course of many trips to all parts of the island.

Nest predation by other birds, however, was very great and was perhaps the most important factor in keeping the numbers of the prolific Bananaquits under control. Among the Bananaquit nests that were kept under observation, the contents were taken from six nests containing eggs and four containing young, apparently by such birds as Lesser Antillean Grackles, Anis (*Crotophaga ani*), Oropendolas (*Ostinops decumanus*), all of which were often seen in the vicinity of Bananaquit nests. This type of predation was totally unexpected since the nests of the Bananaquit are so well made. They are tightly woven with thick walls and completely covered over except for a small one-inch opening at one side, usually near the bottom. Furthermore, this opening is often concealed by overhanging nesting material. Unfortunately the nests are built in very exposed places where they can easily be seen, and they are thus conveniently situated for such predators. The larger bird does not take its victims through the entrance way but thrusts its beak through the top or sides of the nest to reach the eggs or young. All such robbed nests revealed a forced, rounded opening ¼ to ½ inch in diameter through which the contents had been taken. I never succeeded in seeing the theft taking place, but in several instances I did see the suspected birds on or near the nest either before or after the robbery had taken place. I never saw a Bananaquit offer any resistance to such an intruder. There was not even a note of protest; rather, the parent bird or birds would fly away noiselessly. This made detection of a robbery very difficult, since it was done so quietly and stealthily. A bit of circumstantial evidence was obtained when I saw a Lesser Antillean Grackle mauling and eating a young Bananaquit about three or four days old. In several other nests the eggs disappeared, but there was no evidence that the nests had been pierced as noted above. Of the many empty nests examined in the course of various trips to all parts of the island, some had a round, pierced opening in the nesting bowl, indicating that the same sort of predation had taken place.

One nest found in an orange tree near Bacolet Guest House contained a dried mass of flesh and bones of two well-advanced young which probably starved when the adults for some reason failed to return. In another nest the bowl was completely filled with a mass of ants, including pupae. Here also were the bones of young Bananaquits, approximately 12 days old, which doubtless had been killed and the flesh eaten by the ants. Ants are very abundant in the tropics, and it would not be surprising to find other broods

that meet with this sort of destruction. One nest was occupied by two giant grasshoppers, and Mr. Thornton W. Burgess informed me that he once found a small murine opossum (*Marmosa* sp.) occupying a Bananaquit's nest. In nest number 47, built in low vines four feet above the level of a paved road but only six inches from the soil of the bank, I found a six-inch lizard which occupied the nest on three successive days, and which ran over my hand when my finger was thrust into the entrance way. While the murine opossum and the lizard may not have been responsible for destroying eggs or young, they undoubtedly kept the rightful owners from occupying the nests.

## Food

Bananaquits may often be seen searching small branches and leaves for small insects, spiders, and various other bits of food. I have also seen them sip from droplets clinging to plants; these may have been water collected from rain or dew or perhaps sap that had oozed out to the surface of the plant. However, the chief food is the nectar of flowers. The Bananaquit is a bird of the tropics where flowers abound in quantities throughout the year. In fact the presence of nectar-bearing flowers is a factor in determining its distribution and local abundance. Many of the flowers utilized are also visited by various species of hummingbirds, but the manner of feeding is radically different in the two groups of birds. The Bananaquit never feeds while poised in mid-air on its wings as does the hummingbird. Rather it remains perched among the blossoms or grasps the stems of the flowers. On Tobago and Trinidad there are many Hibiscus flowers of various colors which grow in profusion in immense hedges and clusters along the roadsides or in gardens. This flower the Bananaquit approaches from the rear, grasping the supporting stem. On reaching the flower which may be upright or bent downward, the bird thrusts its head between the large petals either from above or below, and with its sharp curved beak and protrusible forked tongue it extracts the nectar stored at the base of the flower. The bird goes from flower to flower, often spending an hour or more at a particular hedge of Hibiscus.

At the Bacolet Guest House, the yellow flower of the vine, *Ipomoea operculina* (Convolvulaceae), which covers some of the Euphorbia hedges and entwines many of the shrubs and palm trees, is a favorite, as is also the yellow flower of the cockrico bush, *Cassia bacillaris*. One morning I saw four Bananaquits taking nectar from flowers of a Moringa tree (*Moringa oleifera*), locally known as the "horse radish tree". On this tree there were numerous clusters of small white flowers mounted on each of 10 to 15 spikes, the arrays of spikes growing out from the ends of the branches. Perched in the midst of the spikes, the birds sipped nectar from the small blossoms by thrusting their beaks directly into each flower, one after the other, before fluttering quickly to the next cluster. The birds were not disturbed by my presence while I watched them from a distance of only eight to ten feet.

A plant extensively cultivated in the gardens of Tobago as well as in other West Indian

islands is the Antigua heath (*Russellia equisetiformis*). This shrub is about two to five feet in height and has bright red flowers, the slender corollas averaging 22–25 mm. in length. While clasping a swaying stem of the heath, the Bananaquit reaches out and thrusts its beak into the outer end of the corolla and pulls it back into such a position that it can easily extract the nectar. Since the beak of the Bananaquit is only 12 to 13 mm. long, the nectar must be collected on the tip of its protrusible tongue.

FIG. 4. Flowers of *Bryophyllum calycinum* whose corollas have been pierced by nectar-seeking Bananaquits.

The small red flowers of *Pedilanthus tithymaloides*, locally known as the "money plant" and in some of the West Indian islands as the "lady zipper plant", are especially popular with hummingbirds and Bananaquits. There was a row of Pedilanthus about 75 feet in length at the yacht club at Hastings, Barbados, where Bananaquits could be seen at any hour of the day. At one time I counted nine Bananaquits and four hummingbirds, all busy at this row of flowers. The red flowers are small and insignificant in appearance but apparently have much to offer these nectar-feeding birds. Wherever the money plant was growing one could reasonably expect to see Bananaquits.

There are certain flowers in which Bananaquits exhibit unusual ingenuity in obtaining nectar which otherwise would not be accessible to them. In flowers with extremely long, fleshy corollas, such as the apricot-scarlet flowers of *Odontadenia grandiflora* and especially those of the common *Bryophyllum calycinum* (the latter known locally as "wonder-of-the-world", "life plant" or "flopper"), the nectar is beyond the reach of the bird's bill and tongue. The

Bananaquit solves this problem by piercing the corolla near its base with its sharply pointed beak to extract the nectar (Fig. 4). The flowers wither and drop off soon after being pierced, and the owner of a large arbor of *Odontadenia* complained of the damage done by the Bananaquits. This is the only complaint I heard voiced against these birds.

I have seen stalks of Bryophyllum with as many as 40 to 50 of the flowers in which practically all had been so pierced. Although I observed these plants closely for considerable periods I never saw them pierced by any other species of bird. Apparently this is a foraging habit peculiar to the members of the honey creeper group. There were many flowers of other plants, trees, and

FIG. 5. Bananaquit sampling a piece of papaya. The birds merely sipped the sweet juices and seldom ate bits of fruit.

shrubs which were visited by the Bananaquits; the kinds of flowers utilized must vary considerably in different months of the year. It seems clear that the chief food of these birds is nectar and that insects and other matter constitute but a minor part of the diet.

The Bananaquits have an insatiable appetite for sugar or sweetened water and prefer these to other foods when made available. The confiding, fearless little birds enter the homes of man as well as the open dining rooms of hotels to feed on sugar in sugar bowls or the remaining undissolved sugar left in the bottoms of tea and coffee cups—even when guests are seated at the tables! At the Bacolet Guest House I had one, and sometimes two or three, of the birds feeding on sugar within inches of me but never quite daring to take sugar

from my hands. They would plunge their beaks into the mass of sugar, then extend their long, forked, saliva-covered tongues to which the grains adhered. At times the sides of the beak would become covered with sugar grains which could not be reached by the tongue but which could be shaken off by a brisk flip of the head. On occasions one bird would be perched on the rim of the sugar bowl, another advancing by way of the spoon and a third "standing by", awaited its turn. The Bananaquits were never tempted by bread crumbs or other bits of food. The birds always appeared promptly every afternoon when tea was served at Bacolet. They sometimes brought their young, which would perch on the rim of a sugar bowl with wings fluttering and mouths held wide open, begging for sugar from the adult feeding from the opposite side.

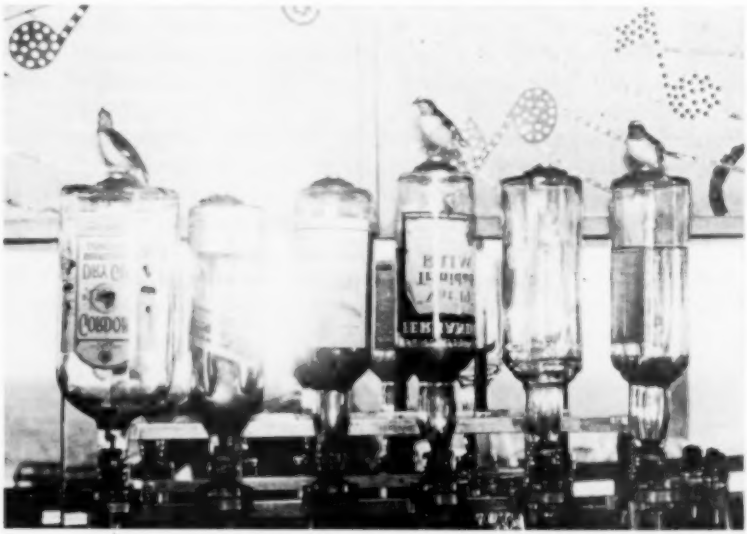

FIG. 6. Three Bananaquits awaiting their turn to sip liqueur from corks of bottles or from glasses on the bar at the Blue Haven Hotel. Two other Bananaquits were on the bar (below) when this photograph was taken.

I always kept sugar, as well as saucers and cups of sweetened water, on the veranda of our room, where there was an all-day succession of Bananaquits. One day one of them took a bath in a saucer of thick sugar water, and as a result its whole plumage was a viscous mess requiring a bath in pure water and prolonged preening of its feathers. I also had fruits such as papaya and over-ripe bananas on the feeding shelf, primarily for mockingbirds. The Bananaquits at times sipped the juices of the fruits but seldom ate bits of the

fruit (Fig. 5). They much preferred the sugar or sweetened water. On Tobago this feeding habit has given rise to the well-merited local name of "Sucrie" or "Sugar Bird". The birds were also seen lapping the corks or tops of opened syrup and honey bottles. Once a Bananaquit was seen, in the middle of a back road, feeding on the juice of a piece of crushed sugarcane. This food-eating habit was also noted in Barbados, where the bird often resorts to sugarcane for food.

At the Bacolet and Blue Haven hotels on Tobago Island there are bars which are open and not enclosed by glass windows or screens. Here the Bananaquits were seen to alight on the liqueur bottles and lick the fluid from the corks (Fig. 6); others visited small liqueur glasses on the bar which had not been completely emptied by the human drinkers. At the Blue Haven Hotel I saw five Bananaquits at one time so engaged and the bartender informed me that the birds visited him at all times of the day to obtain the "exhilarating" fluid. However, I never detected any unusual behavior on the part of the birds after such indulgence.

The hotel management as well as their guests welcome the little "Sugar Birds". Indeed they do all they can to encourage these unique visitors which have proved so droll and interesting. I believe the great concentration of Bananaquits in the vicinity is due in part to this attitude and to the fact that so many hotels and local residents provide them with an abundance of sugar. The great number of flowers which provide the Bananaquits with their chief food, nectar, is also an important factor in maintaining large populations of these birds in many parts of Tobago.

## Summary

The Bananaquit is represented on the island of Tobago by the form *Coereba flaveola luteola*. It is the island's most abundant species of bird. Fifty-four nests were found within a half-mile radius of Bacolet Guest House, located on the south shore, during a six-week period, January 8 to February 21, 1957.

On Tobago, the nests of the Bananaquit were built in exposed locations in a great variety of situations at all altitudes of the island, and at heights varying from one foot to 65 feet from the ground. The birds were most abundant in the cultivated lowlands.

The Tobago birds did not exhibit the strong territorialism reported for some of the other races of the Bananaquit.

The manner of constructing the nests is presented in detail. Four nests dissected were found to have from 404 to 650 items of nesting material. The nests are of two kinds: brood and roosting nests which are essentially similar in size, form, and materials. Brood nests may also be used as roosting nests before the eggs are laid or after the eggs or young are destroyed.

Twelve eggs averaged 17.92 × 13.5 mm. in size, slightly larger than the size reported for other races. The number of eggs per complete set is 2 or 3.

The incubation period in five cases was 12 days. The incubation period of other subspecies of the Bananaquit has been reported to be 12 or 13 days.

The song is reported for other subspecies of the Bananaquit to be confined to the males and there is no evidence to the contrary in the subspecies *luteola*.

An enemy of the Tobago Bananaquits is the native who traps the birds to sell as caged pets. The predation by other birds which feed on the eggs and young of the Bananaquits is considerable. The contents are taken by piercing the top or sides of the nests by means of the predator's beak.

The chief food of the Bananaquits is the nectar of flowers. The method of obtaining the nectar is discussed, with several types of flowers given as examples. The Bananaquits have an insatiable appetite for sugar or sweetened water. Any sweet liquid substance such as honey or syrup is also taken when available. An unusual source of food was the liqueur from bottles and glasses in the bar rooms of the hotels.

The great concentration of Bananaquits in the Bacolet area is probably due to the generous attitude of the people towards these birds as well as the abundance of flowers which supply the birds with nectar during all times of the year.

## Literature Cited

Belcher, C., and G. D. Smooker
1937 Birds of the colony of Trinidad and Tobago. *Ibis*, 1937:504–550.

Biaggi, V., Jr.
1955 The Puerto Rican honeycreeper (Reinita) *Coereba flaveola portoricensis* (Bryant). *Special Pub. Univ. Puerto Rico, Agric. Exper. Sta.*:1–61.

Bond, J.
1936 Birds of the West Indies (first edition) Acad. Nat. Sci., Philadelphia, 456 pp.

Devas, R. P.
1954 Birds of Grenada, St. Vincent and the Grenadines. Macmillan Co., New York, 76 pp.

Hellmayr, C. E.
1935 Catalogue of birds of the Americas. *Field Mus. Nat. Hist., Zool. Ser.*, 13, pt. 8.

Ridgway, R.
1902 The birds of North and Middle America. *Bull. U.S. Nat. Mus.*, 50, pt. 2.
1912 Color standards and color nomenclature. Washington, D.C.; published by the author.

Skutch, A. F.
1954 Life histories of Central American birds. *Pac. Coast Avif.* no. 31.

11 Boody Street, Brunswick, Maine, July 30, 1957

# GENERAL NOTES

**The motivation of sun-bathing in birds.**—A report of observations on sun-bathing in birds (Hauser, 1957. *Wilson Bull.*, 69:78–90) considers the relative importance of "heat" and "light" in initiating this behavior pattern in direct sunlight. Mrs. Hauser suggests that "heat, alone, is not the motivating factor." Observations that I have made of sun-bathing by hand-raised birds, though involving artificial conditions, may be of some value in this consideration.

A hand-raised Western Meadowlark (*Sturnella neglecta*) was observed to sun-bathe on a number of occasions, but particularly when the rays of morning sun were permitted to shine directly into the cage. When given the "freedom" of my house trailer, especially during the winter months and early morning hours, this bird would regularly "sun-bathe" in the path of the hot air being forced from the base of a space heater. The posturing in this situation did not differ from that exhibited as a response to direct sunlight. The observation that this reacton to forced hot air seemed independent of light intensity in the trailer prompted me to solicit this same behavior during the evening, under solely artificial light. I then discovered that, once a posture characteristic of sun-bathing had been assumed, I could turn off all lights in the trailer without disturbing or interfering with this behavior. After an interval of one minute of complete darkness, the lights could be turned on and the bird would still be in its characteristic position. Similar behavior was observed in a hand-raised Starling (*Sturnus vulgaris*).

These observations of sun-bathing in captive birds, in response to forced hot air, may be of importance in interpreting and evaluating the stimuli responsible for such behavior in direct sunlight. Sun-bathing has been reported to be particularly conspicuous when the sunlight is bright during periods of relatively low ambient temperature and also in the sunlight that breaks a period of rain or cloudy weather. There is a reference in the article cited above to sun-bathing in dry sand which, though not so stated, may have become warmed by the "full sun." On another occasion, several species were observed sun-bathing on a "compost heap, primarily composed of decaying elm leaves." A thermometer, laid on the leaf bed in full sun, registered 140°F. I am inclined to regard a sudden warming of the bird's immediate environment as being extremely important in the motivation of sun-bathing behavior.—Wesley E. Lanyon, *American Museum of Natural History, New York, January 1, 1958.*

**Baiting of fish by a Green Heron.**—On Lake Eola at Orlando, Florida, many visitors feed the water birds during the winter with the result the birds become very tame. When Howard Hardaway and the writer visited the lake on April 16, 1957, a Green Heron (*Butorides virescens*) was fishing from a low retaining wall on the edge of the lake. When we threw him a piece of bread, he picked it up and placed it in the water. At first we thought he was softening it before eating, but instead he allowed the piece of bread to float slowly away. When it was almost out of reach, he picked it up and placed it close to the wall again. Suddenly the heron speared a fish which came up to nibble on the bread. We threw him another piece about one inch square some distance back from the wall. The heron picked it up and ran back to the edge of the lake and again started fishing with the bread as bait. Several times when some American Coots (*Fulica americana*) swam in after the floating bread, the heron retrieved it and drove away the intruders with threatening strokes of his long bill. As soon as the coots were dispersed, he again placed the bread in the water near the wall and resumed his fishing.

When we threw the bread too far into the lake for the heron to reach it, he became very excited as he watched numerous small fish nibbling on it. Twice, on such occasions, the Green Heron leaped into the deep water and once came up with a fish in his beak. The fish evidently could see the heron standing on the wall, for they approached the bread more cautiously when it was near the heron than they did when it was thrown farther out into the lake.

Some insight into the steps by which the Green Heron developed this method of fishing was obtained by watching an American Egret (*Casmerodius albus*), which was also fishing along the wall at Lake Eola. When we threw a crumb near him, he would not eat or even touch it, but he did walk over opposite it. There he stood until some fish started nibbling on the bread and then expertly seized a fish. He would not touch bread thrown on the land, since he had not learned to place it in the water to attract fish. The Green Heron probably started in this way, but then having learned to associate bread with fish, went one step further and learned to place the bread in the water.

A clear indication that the Green Heron knew what he was doing was furnished by the following incident. While he was standing by some floating bread, several small fish broke the surface of the water several feet to his left. The heron immediately became excited, picked up his bread and moved it to almost the exact spot where the fish had appeared.

We observed this procedure for several hours on three consecutive days. Several people present agreed with us that the Green Heron was using the bread crumbs for fishing. —Harvey B. Lovell, *Department of Biology, University of Louisville (Contribution no. 13, New Series), Louisville, Kentucky, February 22, 1958.*

**Escape diving by a Spotted Sandpiper.**—On April 24, 1957, while Martin was sitting quietly in a boat on Wheeler Reservoir, in Limestone County, Alabama, about two miles downstream from the community of Triana, a Cooper's Hawk (*Accipiter cooperii*) emerged from brush along the bank and darted toward a Spotted Sandpiper (*Actitis macularia*) that was feeding along the shoreline. The sandpiper flew toward the opposite shore, with the hawk in hot pursuit and gaining. A few yards from the boat, with capture imminent, the smaller bird folded its wings and dived into the water, disappearing below the surface. The hawk wheeled back to the bank, alighted on a limb and turned its head from side to side, as if bewildered by the sudden disappearance of its intended victim. After only a few seconds' submergence, the sandpiper reappeared on the surface and immediately took wing. The hawk did not follow.

A careful examination of the literature on Spotted Sandpipers fails to reveal any previous description of escape diving, but the above incident indicates that the species will resort to this when hard pressed.—Leo M. Martin and Thomas Z. Atkeson, *U. S. Fish and Wildlife Service, Box 1643, Decatur, Alabama, March 25, 1958.*

**White pheasants among Ring-necked Pheasants in South Dakota.**—In the fall of 1955 one of the two large commercial pheasant growers in South Dakota showed me a white pheasant cock (*Phasianus colchicus*) which had been produced in his flock, and he asked if it would be possible to "start breeding for albinism." He stated that the cock had been mated to wild-colored hens in the spring, but no white offspring had hatched. In addition to the white cock, there was a lightly mottled hen in the flock. We picked up the abnormal birds for closer examination. When looking at the male's head, it was soon observed that he had dark-colored eyes; not pink eyes.

TABLE 1
BREEDING TESTS INVOLVING A WHITE PHEASANT COCK AND HIS DESCENDANTS

| Year | Sire | Dam | Chicks | Wild | White |
|---|---|---|---|---|---|
| 1956 | White | Wild | 16 | 16 | 0 |
| 1957 | Wild (Sons) | Wild (Daughters) | 41 | 32 | 9 |

True albinos are white with pink eyes and in many species, including birds, they will not transmit albinism to their offspring. Consequently, the dark eyes suggested that the white feather color could be genetic and that a flock of white pheasants might be possible. The owners planned to mate the white cock to the mottled hen for spring chicks. My request was to have him mated to normally wild-colored hens. Eggs from this latter mating were sent to South Dakota State College, Brookings.

Sixteen chicks with the wild-type pattern hatched from the 24 eggs which were received the following spring; none was white. (At the pheasant farm, three young white cocks were reared in 1956.) These findings suggested several possible explanations:

(1) the white plumage condition might not be transmissible, as with albinism;
(2) white plumage might be inherited in a simple manner, but be recessive;
(3) white might be inherited but have low penetrance; that is, it might not show up in some birds which were carriers;
(4) white plumage might be limited to the males;
(5) perhaps the young birds had normal (wild-type) natal and juvenal plumage which would be replaced by white adult plumage.

When the 16 birds hatched in 1956 matured it was easy to discount the last-mentioned possibility. Only by breeding for another generation and/or increasing the numbers of birds could the other four possibilities be tested adequately.

During the hatching season of 1957 additional data, as shown in Table 1, were accumulated. Inasmuch as several white pheasants hatched, possibility no. 1 was excluded. When two of the young white pheasants were identified as females, possibility no. 4 was also excluded. The $F_2$ ratio of whites to wild-type, 9:32, was next subjected to a chi-square test in order to predict whether the mode of inheritance was presumably due to the random assortment of a simple recessive gene, or to a more complex mechanism involving a gene (or genes) with a low penetrance value. A value of $\chi^2_{(1)} = 1.29$ with a probability of approximately .24 indicated that the best aforementioned hypothesis was no. 2; that a simple recessive gene gave rise to white plumage when homozygous.

Since becoming interested in the white-plumaged pheasants, the records of several isolated, wild individuals have come to my attention. During the past few hunting seasons there has usually been at least one hunter who has reported seeing and/or shooting a

TABLE 2
DEAD EMBRYOS FROM 15TH TO 24TH DAYS OF INCUBATION

| | Ring-neck | White |
|---|---|---|
| South Dakota | 7 | 1 |
| New York | 35 | 10 |
| Total | 42 | 11 |

wild white pheasant. In 1956 one was killed at Mansfield, South Dakota. In 1957, one was shot in the Huron area and one was sighted between Flandreau and Lone Tree. Other areas from which white pheasants have been reported are east of Brandt, in Deuel County, and south of Sioux Falls. In addition to these reports, there have been accounts of mottled or pied pheasants. In Bruckner's report dealing with white pheasants (1941. *Auk*, 58:536) it was stated that some individuals which were heterozygous for recessive white had a few white feathers.

Thus it is evident that white pheasants are more prevalent in eastern South Dakota than has been previously reported. And there is good reason to believe that these pheasants are white because of the homozygous condition of the recessive gene rather than because of the rarely-occurring albinism. A stabilized equilibrium of heterozygotes can

FIG. 1. A newly-hatched brood of pheasant chicks showing six with wild-type and two with white down.

be, and undoubtedly is, maintained despite the disadvantages resulting from the white color. Inasmuch as it has been determined that the white is present from the time of hatching (Fig. 1) until adulthood, the mutant birds are extremely vulnerable to predators. The protective coloration enjoyed by chicks with wild-type down and plumage will allow them to blend with the natural backgrounds. However, the white pheasants remain conspicuous and it would be expected that most of them would become eliminated by hawks and other predators before they are able to fly. Their only possible claim to protective coloration would be when there was snow on the ground and this does not normally occur during the growing season.

It is not known how the recessive white gene was introduced into the wild population of this state. Possibilities include mutation, accidental escape of confined white pheasants which interbred with the wild, or purposeful release of white pheasants. However, it is reasonable to predict that there will not be established a large population of wild white pheasants so long as they are subjected to the normal rigors of nature. Further, the frequency of the mutant gene could not increase in the wild population unless there resulted a heterozygote superiority. If for some reason, or reasons, the homozygous normal-plumaged birds were less "fit" than were the heterozygotes, it might reasonably be expected that white pheasants would be seen more frequently in the wild. Similarly, if the white pheasants possessed a superiority advantage, or advantages, one would expect to see an increase of the gene frequency in the wild population. The only possible advantage which has been detected yet, is in late embryonic mortality. In Table 2, the data from South Dakota and New York are combined, showing proportionally more dead Ring-necked Pheasants than would be expected on the basis of the 3:1 ratio. There is

evidence that an unexpected preponderance of heterozygous wild mice (*Mus musculus*) occurs in nature (Dunn and Morgan, 1953. *Proc. Nat. Acad. Sci.*, 39:391).

With a confined rearing program, such as is practiced at the pheasant farms, it should be possible to easily establish a flock of pure-breeding white pheasants. With a limited number of white birds, the fastest way would be to mate the white cock, or cocks, to heterozygous hens. Half of the progeny would be white. As numbers increased, the most efficient breeding program would involve mating white hens with white cocks.—WALTER MORGAN, *Department of Poultry Husbandry, South Dakota State College, Brookings, South Dakota, March 1, 1958 (contribution no. 405, Journal Series, South Dakota State College Agricultural Experiment Station).*

**Recent observations on the Sharp-tailed Sparrow in southern Michigan.**—The Sharp-tailed Sparrow (*Ammospiza caudacuta*) is a rare migrant through Michigan. Norman A. Wood (1951. "The Birds of Michigan," p. 485) listed eight fall specimens, two fall sight records, and one spring specimen, dating from 1878, 1879, 1893, and from the 1930's. There have been very few additional reports of the species in Michigan prior to 1955, and some of these sight records have not been completely satisfactory. Spring records are particularly scarce, but Mr. James B. Fleugel has informed us (letter, September 5, 1957) that he has found Sharp-tailed Sparrows several times in recent years. These were at Grand Beach, Berrien County, Michigan, in the sand dune area bordering Lake Michigan, at the Indiana state line. Fleugel banded individual Sharp-tailed Sparrows there on May 14, 1954, April 28 and April 29, 1956.

Shortly after dawn on September 24, 1955, Mumford flushed a Sharp-tailed Sparrow from a marsh at McIntyre Lake, in extreme southwestern Livingston County. On the afternoon of the same day he saw it, or another individual, in the area. In both cases the bird perched within a few feet of him and allowed sufficient examination to permit a positive identification. In the same marsh on September 28, 1955, Laurence C. Binford, Mumford, Zimmerman, and Richard L. Zusi saw two of these sparrows and eventually captured one in a Japanese mist net. This bird, an immature female, was preserved as a specimen (U.M.M.Z. 150,884). Binford, Robert P. Kirby, Mumford, and Lawrence H. Walkinshaw saw three birds in the area October 8. The observers of September 28 returned to the marsh on October 9 and captured two more Sharp-tailed Sparrows. These were photographed in color, banded, and released. Another individual was seen but could not be flushed into the nets. No Sharp-tailed Sparrow was found by us on October 15, our last visit to the marsh that season.

On September 16, 1956, Gerald L. Brody, Paul Slud, and Mumford found one brightly plumaged Sharp-tail near the site of the first 1955 observations. One week later (September 23), Binford, Kirby, Mumford, Slud, and Zusi failed to find the species in that area. However, Binford, Brody, and Mumford saw three and collected an adult female (U.M.M.Z. 151,955) there on October 7. We could find none there on visits made on October 14 and 21, 1956.

The 1955 specimen appeared indistinguishable from three skins of *A. c. altera* Todd at hand, and Mr. W. E. C. Todd, who kindly examined this and the 1956 specimen, wrote us (letter, June 17, 1957) as follows: "Concerning one (your No. 150,884) there cannot be the slightest doubt; it is an immature *Ammospiza caudacuta altera*, agreeing as it does exactly with our No. 92431 from James Bay, September 21. The second specimen, an adult female, is not so well defined, but on the whole it is nearer *A. c. nelsoni*, with which I would provisionally place it." *A. c. altera* has not previously been recorded from Michigan, although Peters (1942. *Ann. Carnegie Mus.*, 29:205) listed a specimen of

that race from Richmond, Lake County, Ohio. Soft part colors of specimen no. 150,884 were as follows: iris bright brown; tarsi dull flesh color; toes dull yellowish-flesh; upper mandible dusky brown, the base of the commissure yellow; lower mandible dull grayish-flesh, gape yellow.

It was decided in the fall of 1957 to concentrate on collecting more Sharp-tailed Sparrows at McIntyre Lake, in order to determine the relative abundance of the two races. Weekly visits to the marsh were made by various groups, including the following persons: Binford, Brody, Robert S. Butsch, Norman L. Ford, Kirby, Mumford, Haven H. Spencer, Peter Stettenheim, Robert W. Storer, Harrison B. Tordoff, Larry Wolf, and Zusi. Through their efforts, eight additional specimens were secured with mist nets. One of these, an immature male taken September 21, was identified as *A. c. altera*, and the remainder were *nelsoni*. Weights are available for 14 of the 19 Michigan specimens of *Ammospiza caudacuta* (Table 1).

TABLE 1

WEIGHTS (IN GRAMS) OF SHARP-TAILED SPARROWS TAKEN IN MICHIGAN

| Date Collected | Sex | Age | Weight |
|---|---|---|---|
| Sept. 23, 1934 | Female | —— | 15.5 |
| Oct. 4, 1936 | Male | —— | 14.8 |
| May 29, 1939 | Female | —— | 15.0 |
| Sept. 30, 1939 | Male | —— | 17.4 |
| Sept. 28, 1955 | Female | Imm. | 15.4 |
| Oct. 7, 1956 | Female | Ad. | 15.8 |
| Sept. 21, 1957 | Female | Ad. | 14.9 |
| Sept. 21, 1957 | Male | Imm. | 16.2 |
| Sept. 28, 1957 | Male | Ad. | 16.8 |
| Sept. 28, 1957 | Male | Ad. | 17.5 |
| Oct. 5, 1957 | Female | Ad. | 17.5 |
| Oct. 5, 1957 | Male | Ad. | 18.7 |
| Oct. 5, 1957 | Male | Ad. | 20.8 |
| Oct. 5, 1957 | Male | Ad. | 19.2 |

The McIntyre Lake marsh contains wet, boggy pond-margins and dry or nearly dry "meadows." Although present in both habitat types, Sharp-tailed Sparrows were most often seen in the drier areas which supported stands of sedges (*Dulichium arundinaceum* and *Carex* spp.), smartweed (*Polygonum* sp.), scattered clumps of cat-tail (*Typha latifolia*), bulrush (*Scirpus validus*), and reed (*Phragmites communis*). The sparrows definitely favored extensive areas of uniformly low vegetation, one to two feet in height, and were initially flushed from such sites. They avoided the widely spaced clumps of cat-tails and reeds unless frightened there by our activities. Most of our 1957 specimens were captured at the edges of cat-tail clumps, into which we had first chased the birds.

A specimen collected by J. C. Wood in Wayne County in September, 1893, was "in thick 'eel grass' on mud flat" and was killed with a stone from a slingshot, according to label notations. This last comment reflects the lack of fear of some Sharp-tailed Sparrows. Most of the individuals we encountered were easily observed. They would fly from the sedges a few feet ahead of us, go a short distance, and again drop into the marsh, from which they seldom could be flushed a second time. However, they, like the Atlantic coast races of the species, could be readily lured to exposed perches by loud, repeated "*psssh*" sounds which seemed to induce response more readily than

"squeaking." Unlike many species, Sharp-tailed Sparrows which have once responded remain in view for several minutes allowing detailed study with binoculars or telescope.

Fall dates of occurrence of this species in southern Michigan range from September 16 (1956) to October 16 (1935), with most observations falling between September 23 and October 9. Fleugel reports: "In the fall I see them the last week of September through the first week in October." His records indicate that Sharp-tailed Sparrows enter Michigan in the spring as early as April 28, but he also notes that they are most numerous the last week in May. The May 29, 1939, specimen further bears out his observations. We wish to thank Fleugel for making his notes available to us.—Russell E. Mumford, *University of Michigan Museum of Zoology, Ann Arbor, Michigan,* and Dale A. Zimmerman, *Department of Biology, New Mexico Western College, Silver City, New Mexico, April 4, 1958.*

**Brown-headed Cowbird fledged in nest of Catbird.**—In a search through the literature on the Catbird (*Dumetella carolinensis*) and the Brown-headed Cowbird (*Molothrus ater*), I have found no documented record of cowbirds being hatched or fledged in the nest of a Catbird. Trautman (1940. *Misc. Publ. Mus. Zool. Univ. Mich.*, no. 44: 393) lists two examples of Catbirds feeding cowbird young out of the nest. No details were given. Elder (1921. *Bird-Lore*, 23:185) stated that he had known of cowbirds being reared in the nests of Catbirds but gave no further information. Friedmann (1929. "The Cowbirds," p. 193) stated that, "The Robin, Catbird and Yellow-breasted Chat are examples of absolutely intolerant species." Further (p. 253) in reference to the Catbird he wrote, "As far as I know the Cowbird has never been definitely reported to be successful with this bird . . ." Bent (1948. *U.S. Nat. Mus. Bull.* no. 195:346) stated that, "it is obvious that the catbird is very intolerant of foreign eggs."

My field studies of about 3,000 nest records of the Catbird for southern Michigan over a period of 30 years show only eight nests parasitized or about one in every 375. My records of cowbird parasitism of the Catbird, all in Oakland County, Michigan, except the last, were on the following dates: One nest, June 11, 1939; two nests, May 28, 1950; one each on July 16, 1950, and May 12, 1951, May 28, 1952, June 1, 1953, and June 19, 1957. Six nests held one cowbird egg each at the time of discovery, and one nest held two eggs of the parasite. The cowbird eggs in two nests were partially covered by the nest linings, and two were laid in nest foundations so as to be completely covered by more than two inches of nesting material. All cowbirds' eggs had disappeared from five nests in less than a day from the time they were laid, one egg disappearing in less than an hour after being deposited. These eggs were probably ejected by the hosts, for in all instances the hosts' eggs remained undisturbed. Only the nest containing two cowbird eggs and two of the host showed evidence of possible removal of host eggs by the cowbird. The shells of cowbird eggs were found under three nests from which they had been removed.

On June 11, 1939, I placed a cowbird egg in the nest of a Catbird a short time after the Catbird's third egg had been laid. At 8:00 the next morning I observed that the fourth Catbird egg had been laid and that the cowbird egg had disappeared. One egg of the Catbird had been pierced. About three hours later I found another Catbird egg pierced, and the nest deserted. On June 27, 1941, I placed a 3-day-old cowbird in a Catbird's nest which contained four young about the same age. Three hours later the cowbird had disappeared, and one Catbird young was on the nest foundation outside the nest. I replaced the Catbird, and it was accepted by the adults. All the young later left the nest successfully. On June 20, 1957, five miles southeast of Windsor, Essex

County, Ontario, I found the nest of a catbird in a thick clump of hawthorn, 117 inches above the ground. The nest held two six- or seven-day-old Catbirds and one almost-fledged cowbird a day or two older. All three young were banded with Fish and Wildlife Service bands and placed back in the nest. The Catbird young stayed but the cowbird flew to another clump of hawthorns about 30 feet away where it was captured and returned to the nest. Both adult Catbirds made outcries and engaged in flogging at the nest and the site where the cowbird young was recaptured.—WALTER P. NICKELL, *Cranbrook Institute of Science, Bloomfield Hills, Michigan, March 28, 1958.*

**Singing by female Indigo Bunting and Rufous-sided Towhee.**—The purpose of this note is to add two species, the Indigo Bunting (*Passerina cyanea*) and the Rufous-sided Towhee (*Pipilo erythrophthalmus*), to the list of those in which the females, "ordinarily considered songless, may occasionally sing" (M. M. Nice. 1943. *Trans. Linnaean Soc. New York*, 6:131). Both bunting and towhee were heard near Bloomington, Indiana, on dates falling at the very beginnings of the nesting seasons of their respective species in this locality.

*Passerina cyanea.*—This female, a bird with no blue visible in her plumage, sang during two brief intervals on May 29, 1956, a cloudy day with temperatures of 66° and 76°F. at the times of singing. At 5:01 a.m. Central Standard Time she mounted to the top of a 15-foot Virginia pine, the highest perch within 20 yards in scrubby old-field growth. During the next two or three minutes she sang 10 loud songs, described below, then moved a few yards and sang 10 more from a spot out of my sight. Between 9:11 and 9:21 she sang six times from the same general location, but again I could not see her. There was no repetition of the song during the rest of the day, all of which I spent watching a Prairie Warbler (*Dendroica discolor*) nest in this field. I did not hear the song here on four other dawn-to-dark watches and many briefer ones between May 17 and June 8.

The song, which was wholly unmusical, consisted of five similar windy, vibrant notes uttered in staccato fashion and seeming to my ear to rise in pitch from first to last. I was reminded of the abrupt, choppy song of the Dickcissel (*Spiza americana*) and could not have identified the singer's species by her voice.

A male Indigo Bunting was on territory in the field, and though he sang and was in view repeatedly throughout May 29, I neither saw nor heard him while the female was singing. A female was found incubating on this territory some two weeks later.

*Pipilo erythrophthalmus.*—At 4:30 a.m. on April 23, 1957, a cloudy morning with the temperature at 65°, I heard a loud and unfamiliar song, faintly reminiscent of the utterance of the male towhee. A female was perched 14 feet high in the top of a flowering dogwood (*Cornus florida*) in an old field; in five minutes she sang 15 times, then flew down and fell silent. I heard her no more, although I passed the spot daily and in June spent two full days watching warbler nests nearby. A male towhee held territory there, but he was not in evidence within 15 minutes of the time when the female sang. A towhee nest with eggs was being incubated in May.

The song under discussion was made up of five and sometimes six notes, a long "dee" followed by a series of rapid "da" sounds on the same key. The quality was labored and unmusical, flat and somewhat squeaky.

It will be noted that each of the foregoing singers is like the female Song Sparrow (*Melospiza melodia*) in certain particulars mentioned by Mrs. Nice (*op. cit.*, 127): The song "is confined to the period in early spring before nest building begins . . .; it is always given from an elevation—a large weed, a bush or even a tree, in contrast to the

female's usual behavior of staying close to the ground; it is short, simple, and entirely unmusical." Like the female Song Sparrow's performance, too, those described here apparently elicited no responce from other birds of the relevant species.—VAL NOLAN JR., *Indiana University, Bloomington, Indiana, March 14, 1958.*

**Semipalmated Sandpiper from Tamaulipas.**—On August 21, 1954, J. R. Alcorn collected two Semipalmated Sandpipers (*Ereunetes pusillus*), 20 miles southeast of Matamoros, Tamaulipas, along the Gulf Coast in the vicinity of the Laguna del Barril. The measurements of the two specimens (KU 34475, male; KU 34474, unsexed) are, respectively: bill, 18.5 and 17.0 mm.; wing (chord), 88.0 and 94.0 mm.

These specimens are the first of this sandpiper from Mexico outside of the State of Quintana Roo and Cozumel Island (Friedmann, Griscom, Moore, 1950. *Pac. Coast Avif.* no. 29:99). H. E. Dresser (*Ibis*, 1866:37) stated that this sandpiper was not uncommon near Matamoros; Dresser probably took no specimen. The absence of records of the Semipalmated Sandpiper from the coastal states of Mexico is seemingly due to lack of ornithological field work, since this bird is known to winter from the southern coast of the United States south into South America.—MAX THOMPSON, *Museum of Natural History, University of Kansas, Lawrence, Kansas, February 20, 1958.*

**Steller's Jay anting with tobacco smoke.**—Three hand-reared Steller's Jays (*Cyanocitta stelleri*), sent to me from Seattle, Washington, have several hours' liberty each day, but always follow me into the songbird observatory in the early evening where they are safe from predators during the night. Although all three are exceedingly trustful and, while out, remain among the shrubbery or on the lawn within calling distance, one will not let me out of its sight, even following me into the wooded areas surrounding my Windinglane Bird Sanctuary.

While on the lawn, this bird in particular, ants with the small yellow ant, *Tapinoma* sp. Much of the time, however, he stays close by me, never still except when he stands on my shoulder. Should I be smoking a pipe while he is there and the smoke blow toward him he ants with the smoke in the typical manner of anting. Should I light my pipe and blow the match out he grabs it and ants with the hot carbonized end. Should a visitor light a cigarette he will fly past and grab it from the visitor's mouth. Yet, I have not seen him ant with the burning cigarette, which he simply tears to pieces.—H. ROY IVOR, *R.R. 1, Erindale, Ontario, May 29, 1958.*

# ORNITHOLOGICAL NEWS

Attention of the membership is called to a large manuscript by Aretas A. Saunders entitled "The Songs and Calls of American Birds," deposited with the Wilson Ornithological Society in the Josselyn Van Tyne Memorial Library until such time as its publication is possible. In two large manuscript cases (text and illustrations), it is too detailed and technical to be of interest to the ordinary bird lover; but to the serious student of bird song it offers much material otherwise not published, on about 283 species found east of the Rocky Mountains. This manuscript is thus made available for use by Society members, and we owe the author our gratitude.

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We are indebted to William C. Dilger for providing the painting from which the frontispiece of the current issue was made. The cost of publishing of that plate was provided by an anonymous donor.

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Awards for ornithological research are made in April of each year by the Frank M. Chapman Memorial Fund Committee of the American Museum of Natural History, New York. Applications should be received by the Committee no later than March 15. Awards were made in 1958 for the following projects:

Edward Beals, University of Wisconsin: The ecology of the birds of the Apostle Islands.

Robert Ficken, Cornell University: The behavior of the Common Grackle, *Quiscalus quiscula*.

William George, University of Arizona: The significance of the hyoid bones in classifying birds.

Maria Koepcke, San Marcos University, Lima, Peru: A study of the Peruvian collections of birds at the American Museum of Natural History.

Nancy McAllister, University of Michigan: The reproductive ethology of the Pied-billed Grebe.

J. D. Macdonald, British Museum: A study of the bird collections at the American Museum of Natural History.

John Rogers, University of Missouri: The breeding biology and behavior of the Lesser Scaup.

Glen Sherwood, Utah State University: The relationship of the Whistling Swan to other waterfowl in the Great Salt Lake Valley of Utah.

Brenda Sladen, Johns Hopkins University: The respiratory system of birds.

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The Division of Biological and Medical Sciences of the National Science Foundation announces that the next closing date for receipt of basic research proposals in the Life Sciences is January 15, 1959. Proposals received prior to that date will be reviewed at the Spring meetings of the Foundation's Advisory Panels and disposition will be made approximately four months following the closing date. Proposals received after the January 15, 1959, closing date will be reviewed following the Spring closing date of May 15, 1959.

Inquiries should be addressed to the National Science Foundation, Washington 25, D.C.

## JOSSELYN VAN TYNE MEMORIAL LIBRARY

The following gifts have been recently received. From:

American Museum of Natural History—2 journals
Aaron Bagg—1 reprint
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Hervey Brackbill—3 reprints
Pierce Brodkorb—7 reprints, 1 pamphlet
The Devin-Adair Co.—1 book
Doubleday & Co., Inc.—4 books
Crawford H. Greenewalt—2 translations
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Peabody Museum—6 reprints, 4 journals
William H. Phelps—1 book, 4 reprints
Philosophical Library—2 books
Oscar M. Root—1 reprint
Peter Stettenheim—3 translations
Robert W. Storer—2 translations
University of Utah, Division of Biological Sciences—8 reprints, 1 pamphlet
George Wallace—1 reprint
David K. Wetherbee—1 reprint
John Wiley & Sons, Inc.—1 book

The Library Committee, on behalf of the entire membership of the Wilson Ornithological Society, is grateful for the continued generosity of our many donors, and wishes to urge that others lend their support in similar fashion as opportunities arise.

## NOTICE

Manuscripts intended for publication in *The Wilson Bulletin* should be submitted to Dr. H. Lewis Batts, Jr., Kalamazoo College, Kalamazoo, Michigan. Dr. Batts will assume the editorship beginning with Volume 71, 1959. Correspondence relative to the Volume 70 should be directed to the present editor.

## LETTER TO THE EDITOR

In the December, 1957, issue of the *Wilson Bulletin* (pp. 364–367), Irby Davis contributed some useful information on the habits of some little-known Mexican birds. The material in his note undoubtedly represents a significant addition to the literature of Mexican birds, but certain of Davis's remarks call for comment.

Mayr, Linsley and Usinger (1953. "Methods and Principles of Systematic Zoology," p. 4) point out that "The amateur will always play a most important role in assembling much of the raw material with which the taxonomist works, but he needs a broad background and special training if he is to make direct taxonomic contributions of the quality which will be required in the future." One group of amateurs who have much to contribute in the way of information useful in helping to determine relationships consists of the "field students" for whom Davis has elected himself as spokesman. As evidenced by many recent taxonomic studies, such matters as vocalizations, reproductive behavior and feeding behavior are being utilized as clues to relationships where they appear to be pertinent. Without an understanding of other types of evidence invoked in taxonomic studies, however, and without the "broad background and special training" mentioned above, the "field student" cannot appreciate the *relative* significance of his observations. When he attempts to make taxonomic deductions directly from his field notes, the results are all too often unfortunate. The Davis paper provides an example. Davis has ventured to apply his field studies to classification in two instances at the generic level and one at the specific level. I will take these up one by one.

"*Antiurus maculicaudatus*".—Davis has apparently copied this misspelling of the specific name (properly *maculicaudus*) from Cory (1918. "Catalogue of Birds of the Americas," pt. 2, p. 135), since the correct spelling was given by Ridgway when he introduced the generic name *Antiurus* (1912. *Proc. Biol. Soc. Washington*, 25, p. 98), and later by Peters (1940. "Birds of the World," vol. 4, p. 201) and Friedmann, Griscom and Moore (1950. *Pac. Coast Avif.* no. 29, p. 157). Mentioning that the latter authors have placed this species in the genus *Caprimulgus*, Davis states "However, it has habits so different from typical members of *Caprimulgus* that it would seem best to retain the older classification." This is the only justification offered for the revival of the generic name *Antiurus*. But what are the "typical members of *Caprimulgus*"? Perhaps it may be that the Mexican Whip-poor-wills with which Davis is most familiar are the *atypical* species. Peters' Check-list includes no less than 39 species under *Caprimulgus*. Is Davis prepared to state which of these have "typical" habits? Is he familiar with the habits of *C. europaeus*, the type species of the genus? Is he certain that the habits of *ridgwayi* (which he includes in *Caprimulgus*) resemble those of *europaeus* sufficiently for a "field student" to consider the two species congeneric? And it is scarcely necessary to point out that "different habits" *alone* are hardly justification for generic separation.

"*Empidonax mexicanus*".—Incredibly, the only justification offered for considering *Aechmolophus mexicanus* a member of *Empidonax* is that "field students always attempt to look it up in that genus when they first encounter it." Davis goes on to say that "It would seem to be helpful to recognize the bird as belonging to that genus." Surely this is a novel approach to taxonomy! Perhaps the next step will be to combine the genera of the Ruby-crowned Kinglet and Hutton's Vireo, since Peterson points out that the two may easily be confused in the field. It might be pointed out that Dr. Zimmer, who was certainly conversant with the taxonomy of the Tyrannidae, specifically stated in his original description of *Aechmolophus mexicanus* (1938. *Auk*, 55, p. 663) that it "has no close relationship" to *Empidonax*, and later refers to "superficial resemblances in color

and size to *Myiochanes* and *Empidonax*." But perhaps Dr. Zimmer's opinion should not carry the weight of that of the "field student" who does not notice the long, pointed crest of *mexicanus* because it is "more often than not decumbant [*sic*]."

"*Vireo semiflavus*".—Davis writes "It does not seem likely that any field student would take seriously the suggestion made by some taxonomists that it is a race of the White-eyed Vireo (*V. griseus*)." This statement reflects a common misunderstanding among amateurs unfamiliar with the principles of systematics. When a taxonomist unites two forms into a single species, one does not become a race of the other; the two are equal components of one species. If *griseus* and *semiflavus* are considered conspecific, the fact that the combined species takes the name *griseus* is purely a nomenclatorial technicality; the Peten Vireo is not a race of the White-eyed Vireo any more than the other way around.

It happens that most modern taxonomists do *not* follow Hellmayr in his "lumpings" within this portion of the genus *Vireo*. But the only statement of Davis that appears to be presented as evidence against the Hellmayr treatment (other than the "field student" sentence quoted above) concerns the dark iris color of *semiflavus*, but surely Davis is familiar with the geographic variation in iris color of *Cassidix mexicanus*, *Cyanocorax yncas*, *Pipilo erythrophthalmus*, and others.

It should be re-emphasized that I do not minimize the importance of the study of the living bird to taxonomy. This information should certainly be made available, but its proper evaluation should be left to those with the background and training to place such data in proper perspective with data obtained from other methods.—Kenneth C. Parkes

# ORNITHOLOGICAL LITERATURE

EXTINCT AND VANISHING BIRDS OF THE WORLD. By James C. Greenway, Jr. Special publication no. 13. American Committee for International Wild Life Protection, New York, N.Y., 1958: $6\frac{1}{4} \times 9\frac{1}{2}$ in., x + 518 pp., illus. $5.00. (May be ordered from above committee, New York Zoological Park, New York 60, N.Y.)

The author, artist, and others who worked on or financed this book are to be highly complimented on turning out a handsome, valuable and most interesting volume, and for a very reasonable price. The constantly repeated tragedy to bird species caused by man and his exploitation or by his introduced cats, rats and other animals is sad but fascinating reading. One can hope, though, that compending the accounts of all extinct or decimated birds and giving much information on their ranges, habits, and reasons for extinction or reduction in numbers, will be both an inspiration and real help in the cause of preservation of threatened species.

Summarizing the scope of the book: after listing extinct or rare forms in several categories, brief accounts of some "rare birds probably not in immediate danger" are given. There follows a detailed section on the "Geography of Extinction" consolidating much regional information on the extinct or rare birds of North America, and of the West Indian, Hawaiian, various Pacific, and Indian Ocean islands. Accounts of birds known only from bones (not including fossil forms, however) or inadequate descriptions are chiefly in this section. The major part of the book is "Accounts of Extinct or Vanishing Forms" and it is here, especially, that one is impressed with the tremendous amount of careful gathering and organizing of information that went into the book. More than 160 species or subspecies are treated in detail (with long sections, such as 20 pages on the Great Auk, particularly for North American forms) usually as to status, range, habitat, description, habits, and location of specimens.

A bibliography of over 1000 references is a fine feature of the book. It is followed by a list of museums having extinct birds, useful as a cross reference with the species accounts. Lastly, is an index essentially of all genera, species, and vernacular names.

The color plate and 85 drawings by D. M. Reid-Henry are an outstanding feature of the book, for they are excellent. Giving the scale of drawings would have added to their value, but the size of each bird is usually given in the text. Various maps and charts augment the illustrations.

Having made very clear my high regard for the book, I must, nevertheless, list a number of corrections and make certain criticisms. Perhaps a listing by pages, although not pretending to be complete, will be most useful:

*Page*

iv, 50 "*Puffinus newelli*" should be listed as *Puffinus puffinus newelli* if the text and recent revision are followed. On p. 148 the usual name of Newell's Shearwater could probably best be used, or Newell's Manx Shearwater, since this bird is now recognized as a race of the Manx. The difficulties involved in subspecific vernacular names become apparent in examples like this, but such names seem particularly appropriate in dealing with extinct or rare, usually insular, forms.

iv *Moho bishopi* may exist, if anywhere, on Molokai.

5 The Passenger Pigeon is missing!

8 "*Tyto*" should be listed under Tytonidae.

11 A small population of *Palmeria dolei* probably remains on Maui only.

48 The some 13 islands making up French Frigate Shoal are coral islands except for small, rocky La Perouse Pinnacle. The Coast Guard has had a group of men on one island for some 10 years, and a few cats (as of 1954).

51 Laysan has never been "permanently" settled and has been uninhabited for many years now.

166 Regardless of how the Hawaiian and Laysan Island ducks are best classified, there is much confusion in the book. For example, *Anas laysanensis* (p. 167) is called *Anas wyvilliana laysanensis* on p. 50 and *Anas platyrhynchos laysanensis* on p. 10.

179 Koford's estimate of California Condors was 60, not "600." Breeding of this species is not confined to the coastal range but is known to extend inland as in a *Sequoia gigantea* (not a "redwood") in Tulare County, California.

391 "*fuliginosa*" disagrees with *flabellifera* on p. 6.

398 "*Viridonia*" should be put in the genus *Loxops* to agree with p. 7.

400 The heading should be *Loxops coccinea rufa*.

403 Some of the Nukupuus, according to Munro (who I think is correct) are up to 7.5 inches long rather than just 5.

413 "*Psittirostra palmeri*" belongs under the Koa "Finches."

The problems are numerous (indeed, often insoluble) in deciding whether certain birds are truly extinct or probably so or in danger of becoming so, or deciding whether early and inadequately described or preserved forms are hypothetical or not; but Greenway has done a careful and logical job of grouping the hundreds of birds involved. There is some avoidable confusion, though. For instance, at least eight birds (including *Atrichornis clamosus*, *Troglodytes musculus guadeloupensis* and *martinicensis*, and *Psittirostra flaviceps* and *palmeri*) are described as "probably extinct" in the species accounts, but as "extinct" in the summary on pp. 5 and 6. It would have been helpful, too, to describe, as at the start of the main accounts, the exact bases on which birds were included.

Under the "Small Populations" category on p. 10 a more forceful designation than "thought to be in danger of extinction" could well have been chosen for many species. Who can doubt from the massive evidence provided by this book that such species as the Whooping Crane, Ivory-billed Woodpecker, Short-tailed Albatross, Hawaiian Goose, California Condor and others are in anything but *very real danger of extinction*.

The page heading throughout most of the book is "Accounts of Extinct or Vanishing Forms," although it would have been most helpful and logical to use orders or families here. There is no indication or separation of orders in the book, and although birds are taken up in standard sequence, it is too much to expect that, for instance, many readers will know a Kagu is a gruiform bird and be able to follow the discussion on p. 255 as to which suborder it belongs in.

I was a bit disturbed by finding a number of mistakes or inconsistencies chiefly concerning the relatively few forms I had knowledge of, yet in comparison to the scope of the book they are rare and generally not too significant. Considering its many fine features this volume is one of the outstanding contributions to ornithological literature in recent years.—Frank Richardson
Department of Zoology and Washington State Museum
University of Washington
Seattle 5, Washington

# PROCEEDINGS OF THE THIRTY-NINTH ANNUAL MEETING

BY FRED T. HALL, SECRETARY

The Thirty-ninth Annual Meeting of the Wilson Ornithological Society was held at Oglebay Park, Wheeling, West Virginia, from Thursday, April 24, to Sunday, April 27, 1958. The meeting was sponsored by The Brooks Bird Club and the Oglebay Institute.

Four sessions were devoted to papers and two business meetings were held, all in Wilson Lodge. The meeting opened with an informal reception in the Oglebay Park Nature Center on Thursday evening. The host group was The Brooks Bird Club. Also on Thursday evening the Council met in one of the Park Cabins. The Annual Dinner was held on Saturday evening in Wilson Lodge with President John T. Emlen, Jr., as Toastmaster, presenting the presidential address. A most impressive color movie and talk, "Beyond the Shining Mountains," was given by Hal H. Harrison. The local committee had attractively decorated the tables, and souvenir plates with different birds were left at each place setting.

Early morning bird walks were taken in Oglebay Park each day. The scheduled Sunday morning Field Trip to the Raven's Rock Section was almost completely drenched by an all-night heavy rain, but a handful of hardy birders completed the trip and had a bit of pleasant, but wet, birding.

## First Business Session

President Emlen called the meeting to order at 9:30 a.m. Friday, April 25. Mr. Homer Fish, Superintendent of Oglebay Park, and Mr. George Bailey, President of Oglebay Institute, welcomed the members and friends of the Wilson Ornithological Society. President Emlen responded on behalf of the organization. The minutes of the 38th Annual Meeting were approved as published in *The Wilson Bulletin* for September, 1957.

### *Secretary's Report*

The secretary, Fred T. Hall, summarized the principal actions taken at the Thursday evening Executive Council meeting as follows:

1. The Council confirmed the 1959 meeting to be held at Rockland, Maine, from June 11 to 14. The Council looked with favor upon the invitation to meet in Ontario in 1960, but final action was left until the 1959 meeting.
2. The Council elected H. Lewis Batts, Jr., to succeed Keith L. Dixon as editor of *The Wilson Bulletin* and highly commended Editor Dixon for his excellent service.

The Constitutional amendment concerning the increasing of active membership dues to four dollars per year and the sustaining membership to six dollars per year was read to the members and voted approved.

Announcement of appointments which the president had made during the year were as follows: Custodian of Society Properties, Harrison B. Tordoff; American Ornithologists' Union Representative, Olin S. Pettingill, Jr.; Representative to American Association for the Advancement of Science, Harvey I. Fisher; Representative to Parliament of Science, David E. Davis; Representative to International Congress, Olin S. Pettingill, Jr.; Representatives to International Conservation Council, Richard Pough and N. Bayard Green.

The Secretary thanked the membership for the excellent response to the request for papers and cited the very full program ahead.

### *Treasurer's Report*

The treasurer, Ralph M. Edeburn, submitted the following report on the finances of the Society:

## Report of Treasurer for 1957

### General Fund

| | | | |
|---|---|---|---|
| Balance as shown by last report, dated December 31, 1957 | | | $ 3,220.03 |
| **Receipts** | | | |
| Dues: | | | |
| Active | $ 3,796.00 | | |
| Sustaining | 1,025.00 | $ 4,821.00 | |
| Subscriptions to *The Wilson Bulletin* | | 561.00 | |
| Sale of back issues and reprints of *The Wilson Bulletin* | | 252.98 | |
| Gifts: | | | |
| Library Book Fund | $ 23.30 | | |
| Miscellaneous | 22.56 | 45.86 | |
| Interest on Investments and Savings | | 414.54 | |
| Refund—Registration Duluth Meeting | | 98.69 | |
| Miscellaneous Income | | 5.07 | 6,199.14 |
| Total Receipts | | | $ 9,419.17 |
| **Disbursements** | | | |
| *The Wilson Bulletin*—printing and engraving | | $ 6,261.80 | |
| *The Wilson Bulletin*—mailing and maintenance of mailing list | | 966.84 | |
| Editor's Expense—clerical, postage, and telephone | | 96.56 | |
| Treasurer's Expense—printing, postage, etc. | | 170.91 | |
| Secretary's Expense—stationery, printing, postage for annual meeting | | 225.95 | |
| Back issue distribution | | 28.42 | |
| Purchase of back issues and reprints | | 47.33 | |
| Committee Expense—postage and printing | | 34.96 | |
| International Committee on Bird Protection | | 10.00 | |
| Miscellaneous | | 9.33 | |
| Total Disbursements | | | $ 7,852.10 |
| Balance on hand in Twentieth Street Bank, Huntington, West Virginia, December 31, 1957 | | | $ 1,567.07 |

### Endowment Fund

| | | | |
|---|---|---|---|
| Balance in Savings Account as shown by last report, dated December 31, 1956 | | | $ 909.96 |
| *Receipts:* | | | |
| Sale of U.S. Savings Bonds (matured) | | $ 4,325.05 | |
| Life Membership Payments | | 650.00 | 4,975.05 |
| 4 Shares Mass. Invest. Trust at 9.71 (included below) | | | |
| Total Receipts | | | $ 5,885.01 |
| *Disbursements:* | | | |
| S. Morris Pell Painting Grants (2) | | $ 50.00 | |
| Purchase 15 Shares Kaiser Aluminum and Chemical Corporation 4¾% cvt. pfd. | | 1,500.40 | |
| Louis Agassiz Fuertes Research Grant | | 100.00 | |
| Purchase U.S. Treas. Bonds 4% 10/1/69 | | 3,000.00 | |
| Total Disbursements | | | $ 4,650.40 |
| *Balance in Savings Account, Twentieth Street Bank, Huntington, West Virginia, December 31, 1957 | | | $ 1,234.61 |

*Securities Owned*

| | | |
|---|---|---|
| U.S. Treas. Bonds, 4%, Mature October 1, 1969 | $ 3,262.50 | |
| U.S. Savings Bonds, Series "F," dated February 1, 1947 (maturity value, $2,000.00) | 1,890.00 | |
| U.S. Savings Bonds, Series "F," dated April 1, 1947 (maturity value, $2,000.00) | 1,828.00 | |
| U.S. Savings Bonds, Series "F," dated October 1, 1948 (maturity value, $1,450.00) | 1,305.00 | |
| U.S. Savings Bonds, Series "F," dated April 1, 1950 (maturity value, $1,000.00) | 862.00 | |
| Total Value of Government Bonds | $ 9,147.50 | |
| Kaiser Aluminum and Chemical Co. Stock, 4¾% (15 shares at $83.00) | 1,245.00 | |
| Massachusetts Investors Trust (382 shares at $9.71) | 3,709.22 | |
| Fireman's Fund Insurance (70 shares at $43.50) | 3,045.00 | |
| Total Securities Owned | | $17,146.72 |
| Total in Endowment Fund, December 31, 1957 | | $18,381.33 |

Bonds carried at redeemable value December 31, 1957
Stocks carried at closing prices December 31, 1957
* *In Reserve*

| | |
|---|---|
| Louis Agassiz Fuertes Research Fund (special gifts) | $25.00 |

Respectfully submitted,
/s/ RALPH M. EDEBURN,
*Treasurer*

*Research Grant Committee*

Kenneth C. Parkes, chairman, reported that:

The invitation to submit applications for the 1958 Fuertes Research Grant appeared in the December issue of *The Wilson Bulletin*, which was published on January 7, 1958. Deadline for applications was given as April 1. By that date the chairman had received three requests for applications.

The Committee was unanimous in selecting as the recipient of the 1958 Fuertes grant of $100 Mr. Harold D. Mahan of Central Michigan College, Mt. Pleasant, Michigan, for his project entitled "Studies of Growth and Temperature Regulation in the Red-winged Blackbird." All three members of the Committee were impressed by Mr. Mahan's carefully worked out methods and his progress to date.

The original funds from which the Fuertes grants were awarded are now exhausted. The Council of the Society voted at its 1957 meeting in Duluth to continue a research grant program, either using special funds which might be donated in the future for this purpose, or, if necessary, from the General Fund. At this natural transition point, it would seem that a thorough re-examination of the research grant program of the Wilson Ornithological Society is warranted, particularly with respect to its aims, its prospective beneficiaries, possible financial support, and its relationship to other grants in the same general field. It is hoped, for instance, that a special effort will be made to encourage the amateur ornithologist, not affiliated with or a student at a college or university, to apply to the Society for support for a bird study project. Such persons can often put the research grant funds to good use, but equally important is the encouragement that the backing of the Society can give to the recipient and to amateur ornithologists in general in this way.

The Chairman wishes to acknowledge gratefully the valuable assistance and advice

from the colleagues who have served on the Committee during his four-year tenure: Dr. John Davis, who served on the Committee all four years; Mr. Eugene Eisemann for two years; and Dr. Brina Kessel (Mrs. Raymond Roof) and Mr. Chandler S. Robbins, one year each.

A total of twelve awards has been made of the Fuertes Research Grant. In recent years the Committee has requested that recipients of the awards submit at least a portion of the results of the research sponsored by the Society to the editor of *The Wilson Bulletin*, unless prevented by prior commitments. Thus far, four such papers have been published, and more will undoubtedly be forthcoming from some of the more recent recipients who have not yet published their results.

*Membership Committee*

Howard F. Young, chairman, reported the names of 119 new members, enrolled since the 1957 meeting, are posted for the inspection of the members, to be elected at the final business meeting. Thirty-two of these are life memberships and 8 are sustaining.

On December 31, 1957, the Society had 111 life members, 199 sustaining, and 1,218 active members, a total of 1,528. One hundred twenty-eight were cancelled, and 8 reported deceased. This makes a net loss of 40 members since the last report at the Duluth meeting. There are also 191 institutional subscriptions to *The Wilson Bulletin* and 81 exchanges.

*Library Committee*

H. Lewis Batts, Jr., chairman, reported that during the past twelve months 75 donors have contributed to the Society's Josselyn Van Tyne Memorial Library the following items: 50 books, 3,907 reprints, 3 magazines, 143 bulletins, 40 journals, 43 U.S. Fish and Wildlife Service publications, 27 pamphlets, 5 newsletters, and 2 typewritten translations (made and donated by Peter Stettenheim) of articles published in the *Journal für Ornithologie*. Compared to last year, this listing represents a larger total number of items received, and an increase in each category of holdings except magazines and phonograph recordings. Eighty-one journals are received as exchanges for *The Wilson Bulletin*, and 11 others are received as gifts.

Special mention, with gratitude to Mrs. Josselyn Van Tyne, should be made of the 3,300 reprints received from Dr. Van Tyne's personal library. These reprints represent the first installment of the eventual gift of his library to the Society, and amount to about one sixth of the total. These reprints, previously unavailable, have been sorted and are available for use, but are not catalogued as yet. The remainder of Dr. Van Tyne's collection is also available for use by W.O.S. members.

The University of Michigan continues to service the library accessions and to aid W.O.S. members in their use of the library items. The Van Tyne Memorial Library has now been separated from that of the Bird Division and is housed in a separate room, resulting in an addition of shelf space to both libraries.

William A. Lunk has kindly agreed to design and draw a new book-plate appropriate to the changed name of the Society's Library.

*Conservation Committee*

Robert A. Pierce, chairman, reported by letter.

"Again, I wish to express my sincere appreciation for the excellent cooperation which I have received from each member of this Committee which has been composed of P. F. English, Lee E. Yeager, Thomas G. Scott, Lawrence H. Walkinshaw, and Frank Bellrose, Jr. I wish to point out again that the vigorous individual efforts of members of this organization in supporting good conservation legislation and practices on both the national and local level are of the utmost importance. During these days when the

thoughts of many are turning to the exciting problems of space, it is well that we remember that most humans must live on this planet where our problems are equally as exciting, equally as challenging and often of the utmost importance to human welfare and happiness. The efforts which we make individually and collectively to encourage sound conservation practices based on thorough ecological studies will be very important to all humans for centuries as well as to you and me and our immediate heirs, here, in the present.

"As has been reported before, great quantities of insecticides, herbicides, fungicides, and rodenticides are being widely distributed annually, often with much damage to fish and wildlife. Many large scale insecticide treatments are under supervision of competent federal and state authorities who have carefully weighed the possible economic and ecological losses from the effects of the pests against potential losses from the effects of insecticide treatment. Some large scale treatments and many local treatments appear to be either in the hands of incompetents or of 'egomaniacs' who feel that their particular solution to a problem is so fine that it must be carried out irrespective of its effects on the ecological community or of the rights or desires of the citizens. In all cases there is a tremendous lack of the intensive basic ecological investigations which are needed on which to base control measures and to predict their effects.

"Lack of information hampers conscientious administrators in judging all the effects of pesticide treatments. For instance, Ide in Canada (1956. *Trans. Amer. Fish Soc.*, vol. 86, pp. 208–219) shows that spider mites increased to high levels where more than one application of DDT had been made to control spruce budworm and that the macrofauna of streams was adversely affected following spraying DDT at the rate of 0.5 pounds per acre. The volume of insects available to young Atlantic salmon was decreased, and many of the insects eliminated had not become reestablished even in the second year after spraying. A spectacular result of the use of insecticides without consideration of the consequences occurred in Florida in May, 1955, where dieldrin, applied at the rate of one pound per acre by county officials to control sandfly (Culicoides) larvae in St. Lucie County, produced an almost complete kill of fish and crustaceans. The fish killed in 67 miles of ditches totaled 20 to 30 tons in weight, about 1,175,000 individuals of at least 30 species (Robert W. Harrington, Jr., and Wm. L. Bidlingmayer, *Jour. Wildl. Mgmt.*, vol. 22, No. 1, Jan. 1958). The rate of application, incidentally, was one half that proposed for the control of the fire ant in southern United States.

"This lack of information is due to lack of research, and I wish to urge each of you individually to contact your representatives in Congress at once suggesting that they give favorable consideration to Senator Warren G. Magnuson's measure, S. 2447, and Congressman Lee Metcalf's bill, H. R. 783, identical bills which would authorize appropriation of $280,000 annually for study of the effects of economic poisons on fish and game.

"The present program to control fire ants in nine southern states by spraying dieldrin at the rate of 2 pounds per acre over about 27,000,000 acres would appear to be another large scale program undertaken without much regard for all the consequences and, incidentally, in spite of some available information. A large part of this program may be completed before local conservation agencies are able to secure sufficient information to force modification of this plan.

"The large scale use of herbicides is producing many changes, the total effects of which, again, are little understood. In both the use of insecticides and herbicides, active programs are producing changes so fast that biologists are unable to measure them, let alone predict their consequences.

"Considerable effort is being expended upon the release of exotic game birds and

mammals. These programs still have a tendency to become public relations stunts as, for example, was the *Coturnix* program in which over 230,000 were released, many unbanded or recorded, in at least 16 states in 1956 and 1957. It is somewhat alarming to note that in the western states and Hawaii, alone, the following known exotic birds are being considered: Chukars, grey francolins, black francolins, Barbary partridges, *Coturnix*, Spanish red-legged partridge, sand grouse, seesee partridge, and European grey partridge. Most of you are familiar with my views on this subject; they have not changed.

"Important to waterfowl management is Senator Warren G. Magnuson's measure, S. 2617, reported favorably by the Senate Committee on Interstate and Foreign Commerce, which would amend the Duck Stamp Act. S. 2617 would increase the stamp fee to $3 and all of the expected $6,600,000 income, except about $145,000 for printing and distributing the stamps, would be earmarked for land purchase. Up to 40 per cent of waterfowl refuges could be opened for public hunting. Regulations by the Canadian and United States Wildlife Services prohibiting the use of recorded calls in hunting are to be commended as an aid in reducing excessive waterfowl kills. A recent ruling by Interior Secretary Seaton that 10,000 acres in the Lower Klamath–Tule Lake region of Oregon and California, presently being farmed under lease by World War II veterans, must be used in a manner that will fully protect the valuable waterfowl resources of that, is to be commended. Over 7,000,000 ducks and geese that rest and feed on the Tule and Lower Klamath refuges during migration will be affected.

"Favorable reports have been noted regarding the status of the Trumpeter Swan, Laysan, Teal, and Hudsonian Godwit. Apparently faced with extinction, however, is the Hawaiian Nene goose; less than 50 wild birds are now known. The status of the Whooping Crane is still critical, there being but 31 birds now in existence, 26 wild birds and 5 captives. I hope Dr. Walkinshaw, the Society's representative on the Whooping Crane Advisory Group, will give you an up to the minute résumé of the progress being made for their welfare."

*Endowment Committee*

Olin S. Pettingill, Jr., chairman, reported verbally that the Committee had had excellent success in increasing the number of Life Members as indicated in the Membership report. He spoke briefly on the needs of the Society and the plans of his committee.

*Temporary Committees*

The President appointed the following temporary committees:

*Auditing Committee*
N. Bayard Green, Chairman
Robert Van Blaricomb

*Nominating Committee*
Burt L. Monroe, Chairman
Kenneth C. Parkes
George M. Sutton

*Resolutions Committee*
Harold Mayfield, Chairman
Charles H. Blake
Frederick C. Lincoln

SECOND BUSINESS SESSION

The final business session was called to order at 9:30 a.m. Saturday, April 26.

The applicants for membership whose names were posted during the meeting were elected to membership.

*Report of the Auditing Committee*

The committee reported by letter that they had examined the books and accounts of the Treasurer and found them to be in good order.

*Report of the Resolutions Committee*

WHEREAS The Wilson Ornithological Society is in session at its Thirty-ninth Annual Meeting in Oglebay Park, Wheeling, West Virginia,

BE IT RESOLVED that the Society express its appreciation to the local committee under the leadership of George A. Hall and Charles L. Conrad for the good planning and efficient organization that have made this meeting so enjoyable and interesting to the people in attendance; and

BE IT FURTHER RESOLVED that the Society express its thanks to the sponsoring organizations, The Brooks Bird Club and The Oglebay Institute, for making available such fine facilities in such a pleasant setting for this annual gathering; and

BE IT FURTHER RESOLVED that the Bureau of Sport Fisheries and Wildlife of the Department of Interior be commended for the steps taken to perpetuate the Whooping Crane.

*Election of Officers*

The Nominating Committee proposed the following officers for the coming year: President, Lawrence H. Walkinshaw; First Vice-President, Harold F. Mayfield; Second Vice-President, Phillips B. Street; Secretary, Aaron M. Bagg; Treasurer, Ralph M. Edeburn; Elective member of the Executive Council, Ernest P. Edwards (term expiring 1961).

The report of the committee being accepted, and there being no nominations from the floor, the Secretary was instructed to cast a unanimous ballot for these nominees.

PAPERS SESSIONS

*Friday, April 25*

1. George A. Hall, West Virginia University, Morgantown, West Virginia. *Breeding Bird Population Studies in West Virginia, 1948–1957*, slides.
2. Maurice G. Brooks, West Virginia University, Morgantown, West Virginia. *Wood Warblers, West Virginia's Most Characteristic Birds.*
3. Donald J. Borror and William W. H. Gunn. *Songs of Warblers of Eastern North America*, slides and recording.
4. Ira N. Gabrielson, Wildlife Management Institute, Washington, D.C. *Wildlife and the Menace of Chemical Pesticides.*

   Banding Symposium arranged by Chandler S. Robbins, *New Developments in Bird-Banding* (papers 5 through 13)
5. Allen J. Duvall, United States Fish and Wildlife Service, Laurel, Maryland. *The Banding Office in Relation to Recent Developments in Banding.*
6. Helmut C. Mueller, Department of Zoology, University of Wisconsin, Madison, Wisconsin. *The Bal-chatri: a Small Portable Trap for Hawks.*
7. Ralph K. Bell, Clarksville, Pennsylvania. *A Method of Trapping Crows for Banding*, slides.
8. James Baird, Norman Bird Sanctuary, Middletown, Rhode Island, and Chandler S. Robbins, United States Fish and Wildlife Service, Laurel, Maryland. *The Cooperative Atlantic Seaboard Migrant Netting Program*, slides.
9. Charles H. Blake, Hillsboro, North Carolina. *A Way of Using Weights to Determine the End of Fall Migration.*

10. Oliver L. Austin, Jr., Florida State Museum, Gainesville, Florida. *Some Problems in Sea Bird Banding.*
11. Fred A. Glover, United States Fish and Wildlife Service, Washington, D.C. *Waterfowl Nesting Ground Banding Program in the Canadian Prairies.* (Read by chairman for Fred A. Glover)
12. Oliver H. Hewitt, Cornell University, Ithaca, New York. *Capturing Ducks with Lights.*
13. Frank C. Bellrose, Jr., Illinois Natural History Survey, Havana, Illinois. *Orientation Experiments with Waterfowl*, slides.
14. Oliver S. Owen, Notre Dame University, Notre Dame, Indiana. *An Experimental Study of Territorial Behavior in Breeding English Sparrows*, slides.
15. E. Thomas Gilliard, American Museum of Natural History, New York City. *The Courtship of the Greater Bird of Paradise as Observed and Photographed on Little Tobago Island*, movie.
16. Ralph W. Dexter, Kent State University, Kent, Ohio. *Longevity, Age of Breeding and Fluctuations of Abundance in a Colony of Chimney Swifts*, slides.

On Friday evening, Karl H. Maslowski presented a most attractive and educational movie and lecture on our great natural resource, water. This was entitled *Waterway Wildlife.*

An informal reception and exhibition of folk dancing followed Mr. Maslowski's program.

*Saturday, April 26*

17. George J. Wallace, Michigan State University, East Lansing, Michigan. *Studies on Neotropical Thrushes*, slides.
18. Kenneth C. Parkes, Carnegie Museum, Pittsburgh, Pennsylvania. *Possible Adaptive Significance in the Plumage Patterns in the Phalaropes*, slides.
19. Wesley E. Lanyon, American Museum of Natural History. *Relationship of the House Wren* (Troglodytes aedon) *of North America and the Brown-throated Wren* (Troglodytes brunneicollis) *of Mexico*, slides.
20. Frederick C. Lincoln, United States Fish and Wildlife Service. *The Whooping Crane*, movie.
21. Daniel S. McGern, Pontiac, Michigan. *Of Matters Molothrine*, slides.
22. Lawrence H. Walkinshaw, Battle Creek, Michigan. *Some Notes on the Life History of the Field Sparrow*, slides.
23. George M. Sutton, University of Oklahoma, Norman, Oklahoma. *Report on Field Work in the Hudson Bay Area 1956*, water color paintings.
24. Harvey I. Fisher, Southern Illinois University, Carbondale, Illinois. *The Hatching Muscle in the Chick*, slides.
25. Lester E. Eyer, Alma College, Alma, Michigan. *Growth and Development of Young Common Grackles*, slides.
26. P. B. Hofslund, University of Minnesota at Duluth. *Fall Migration of Herring Gulls from Knife Island, Minnesota*, slides.
27. Walter P. Nickell, Cranbrook Institute of Science, Bloomfield Hills, Michigan. *Nesting Associates in a Colony of Black-crowned Night Herons*, slides.
28. William A. Dyer, Union City, Michigan. *Michigan Warblers*, movie.
29. Laurence I. Grinnell, Ithaca, New York. *Bird Jaunts Down Under (New Zealand)*, movie.
30. Richard Herbert, Middletown, Delaware. *Birds of South Africa, Rhodesia, and Kenya*, slides.

ATTENDANCE

Members and guests who registered totalled 241. Twenty states, the District of Columbia, and the Provinces of Ontario and Saskatchewan were represented.

From **Delaware**: 2—*Middletown*, Mrs. Kathleen Green Skelton, Richard A. Herbert.

From **Florida**: 2—*Gainesville*, Dr. and Mrs. Oliver L. Austin, Jr.

From **Illinois**: 5—*Blue Island*, Karl E. Bartel; *Carbondale*, Harvey I. Fisher, Mildred Fisher; *Havana*, Frank Bellrose, Jr.; *Rockford*, Dave Sea.

From **Indiana**: 7—*Connersville*, Edna Banta; *Hanover*, J. Dan Webster; *Indianapolis*, Mrs. S. G. Campbell, Mildred F. Campbell; *New Castle*, Betty Jane Gough; *Richmond*, Mrs. C. S. Snow, Jack N. Wykoff.

From **Kentucky**: 4—*Anchorage*, Burt L. Monroe, Ethelmae T. Monroe; *Louisville*, Mr. and Mrs. Leonard C. Brecher.

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